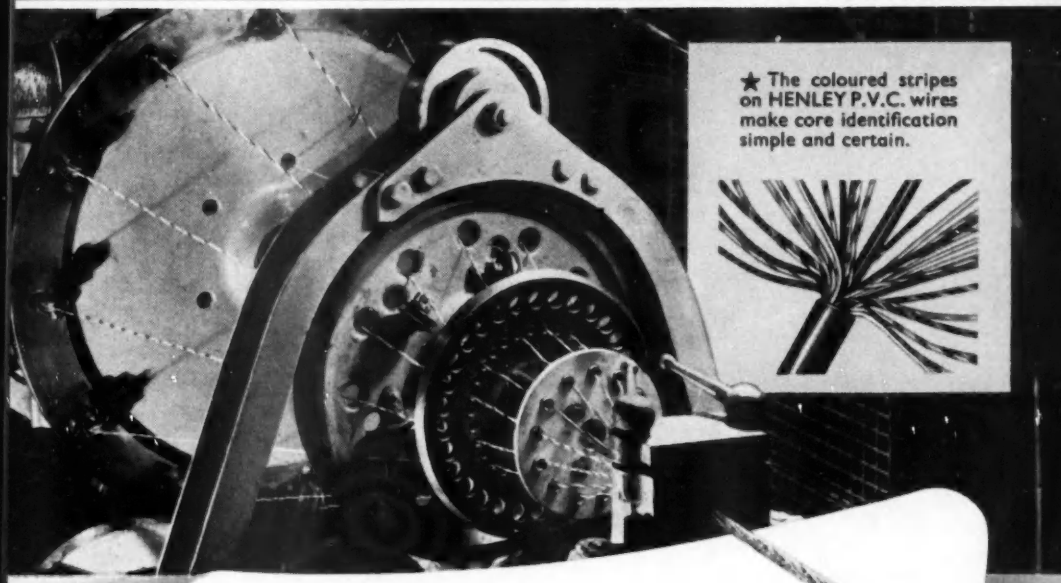
ELECTRICAL TIMES

THURSDAY
26 NOV. 1953
NINEPENCE



★ The coloured stripes on HENLEY P.V.C. wires make core identification simple and certain.

HENLEY

THERMOPLASTIC WIRES & CABLES

Henley's manufacture a very comprehensive range of wires, cables and flexibles insulated with P.V.C. and Polythene for Telecommunications, High Frequency, Television Down Leads, Equipment Wires, etc. Where colour identification of cores is required, the Henley dual marking method provides an extremely wide range of colour combinations. If you have a problem concerning thermoplastic cables Henley's advice is readily available.

★ Ask for Folder 484 describing HENLEY Colour Striped P.V.C. Wires.

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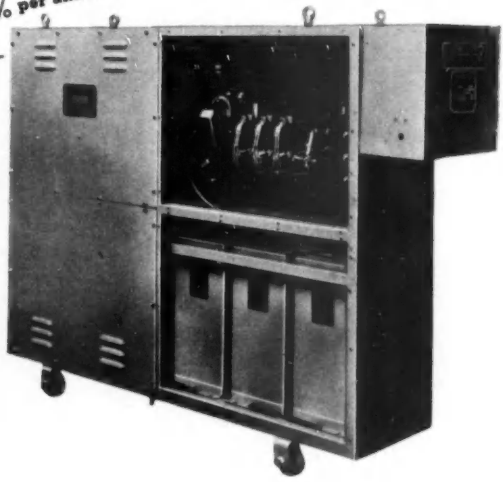
An engineering works purchased power at 415V 50 c/s 3 phase. The tariff included a maximum demand kVA charge of 6/9 per kVA per month. Before installing capacitors the maximum demand of the works was 133 kVA, power factor being 0·75.

After the installation of a DUBILIER capacitor, the power factor was corrected to 0·95 and the maximum demand to 105 kVA, making a reduction of 28 kVA, thus saving £113 . 8 . 0 per annum. The cost of the capacitor installation was £229 . 10 . 0. Therefore a return of 49% per annum on capital outlay was achieved.



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The installation of DUBILIER Power Factor Correction Capacitors represents an economy in power costs which will rapidly reclaim your initial outlay. These capacitors are subjected to the usual rigorous testing and conform to the well-known DUBILIER standard of efficiency and reliability. Let our engineers conduct an investigation of your present power factor without cost or obligation, and confirm whether the installation of DUBILIER capacitors would be to your advantage.

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Frames B183 to B326 inclusive

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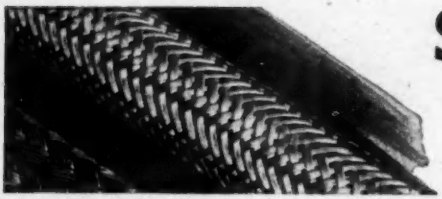
industrial motors

THE ENGLISH ELECTRIC COMPANY LTD., Queens House, Kingsway, London, W.C.2
Industrial Motor Works, Bradford
WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON
BM.16

See the English Electric advertisement for Protective and Auxiliary Relays which appears on page 39 of this issue



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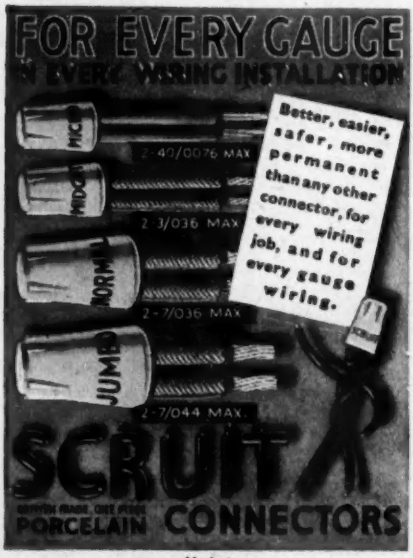
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IN EVERY WIRING INSTALLATION
Better, easier, safer, more permanent than any other connector, for every wiring job, and for every gauge wiring.
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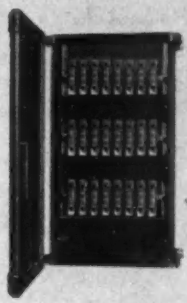

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15 AMPERE FUSES 250 VOLTS
20 " " 440 "
30-300 " " 440 "

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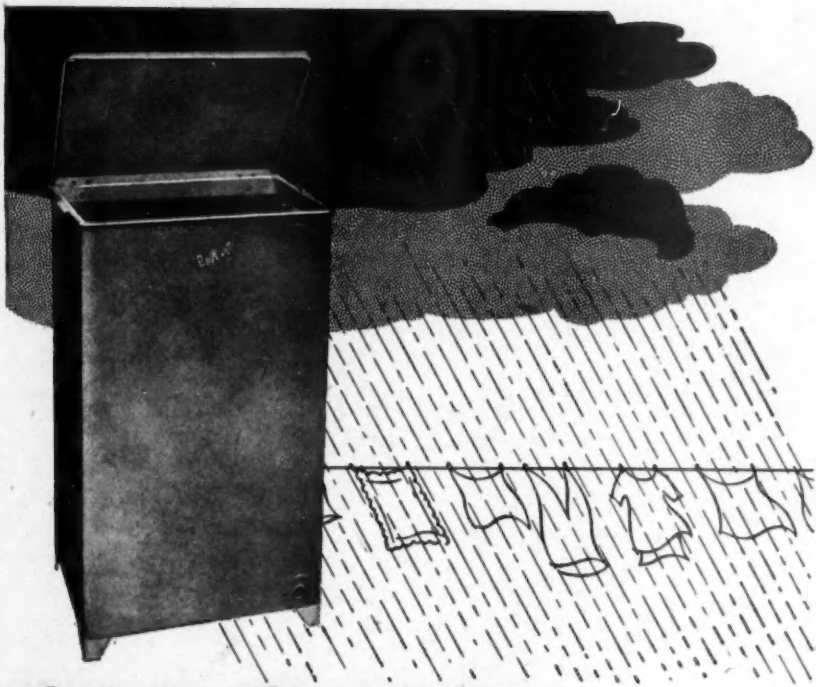

whatever the weather . . . .

Yes, whatever the weather is like out of doors, the Belling Clothes Drying Cabinet soon dries the weekly wash—indoors. You won't have to spend long explaining to a housewife the advantages of that. Occupying a floor space only 21 inches wide and 14½ inches deep, the Belling Clothes Drying Cabinet quickly and thoroughly dries clothes for the whole family, at any hour of the day or night. Extremely popular with mothers of *very* young children! Nothing could be neater in appearance. Inside, warm air currents circulate, quickly removing all moisture from the clothes. The heating elements are fully guarded and the whole cabinet is quite rust and corrosion proof.

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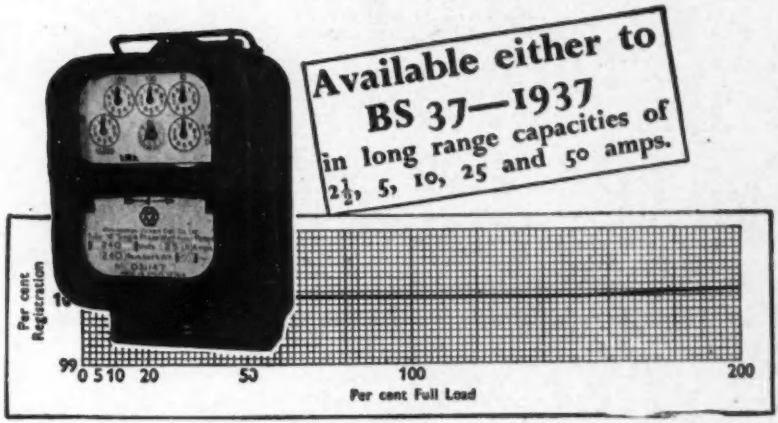
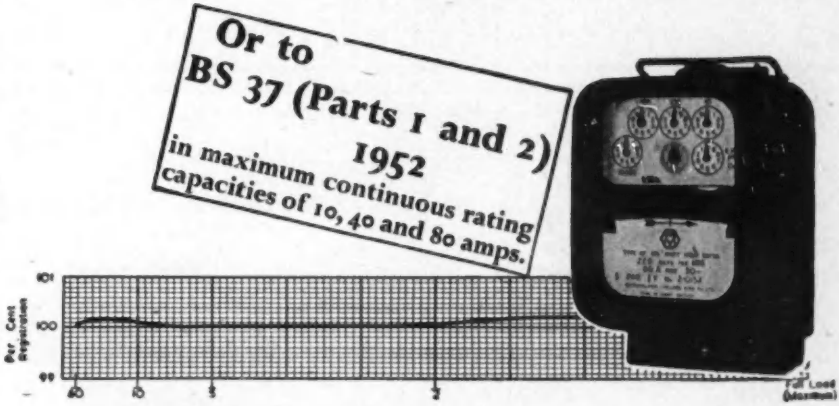
CRC 404

Metrovick Type NF Meters


Available either to
BS 37—1937
in long range capacities of
2½, 5, 10, 25 and 50 amps.
Per cent Registration
99
0 5 10 20 50 100 200
Per cent Full Load



In designing the Type NF meter Metrovick engineers anticipated the requirements of the 1952 specification, consequently the two patterns are fundamentally similar.

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Member of the A.E.I. group of companies

METROVICK *equipment for meticulous metering*

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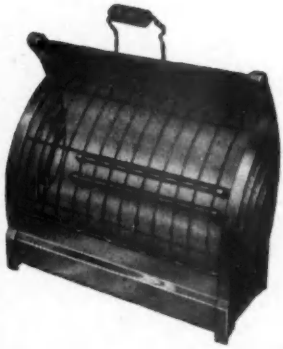

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BULLERS LIMITED design and manufacture both porcelain and metal parts in their own works.

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Porcelain for general insulation.

Refractories for high-temperature insulation.

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Height of post 116"
Cantilever strength 2,000 lb.
Dry withstand test 580 K.V.
Wet withstand test 520 K.V.

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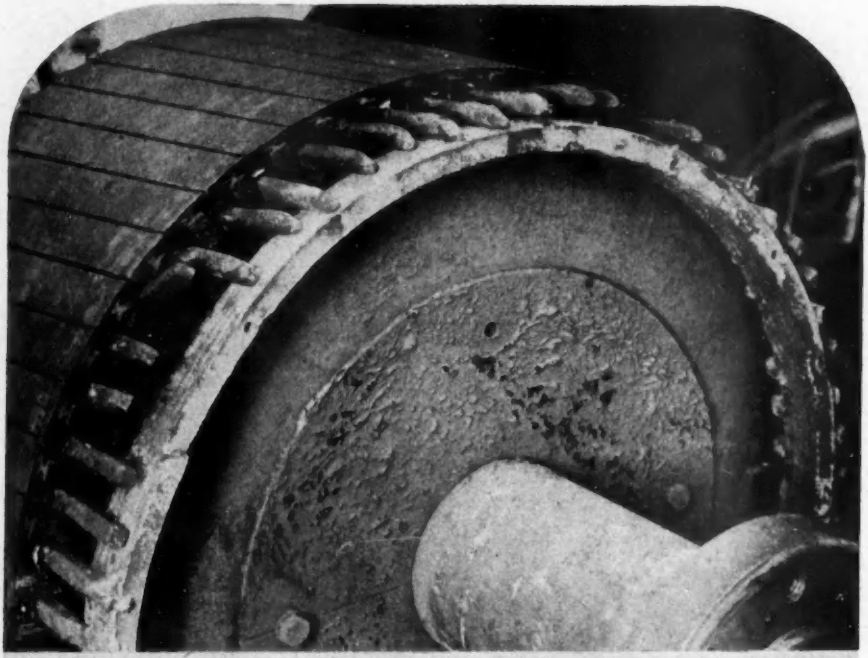

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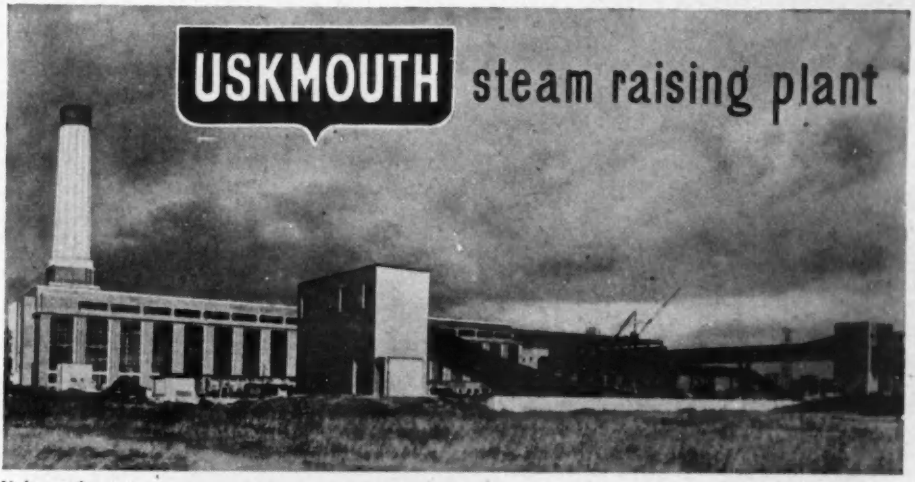


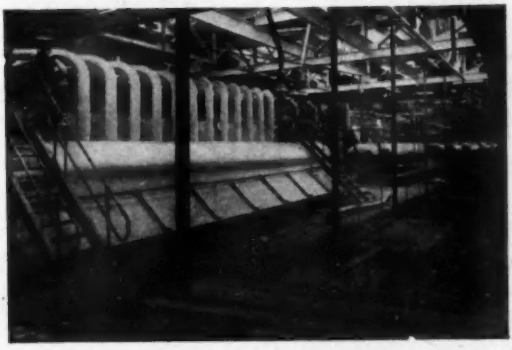
Uskmouth power station under construction, with part of the 600 tons/hr. coal conveyor system in the foreground.

BABCOCK contract throughout

THE steam-raising plant of the new 360 MW. USKMOUTH generating station is entirely BABCOCK. It comprises twelve p.f. fired High-head boilers, with a total capacity of 4,320,000 lb. of steam per hour (M.C.R.) at 950 lb./sq. in. and 925°F.

The contract with Babcock & Wilcox Ltd.—*largest single contract ever placed in Great Britain for steam-raising plant*—includes 36 type E coal pulverizing mills, and impressive coal-handling installation to deal with 600 tons per hour, the extensive ash and dust disposal systems and overhead travelling cranes of capacities up to 175 tons. All covered by one comprehensive contract.

The illustration shows the boilers at drum level.



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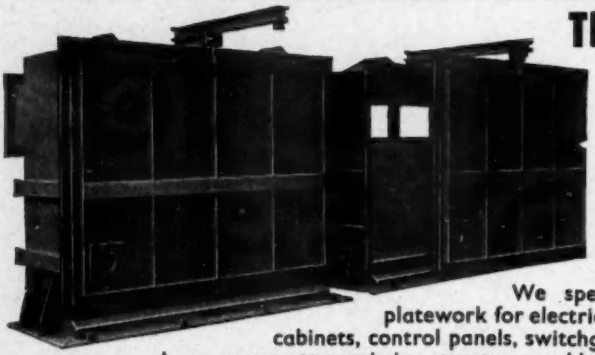

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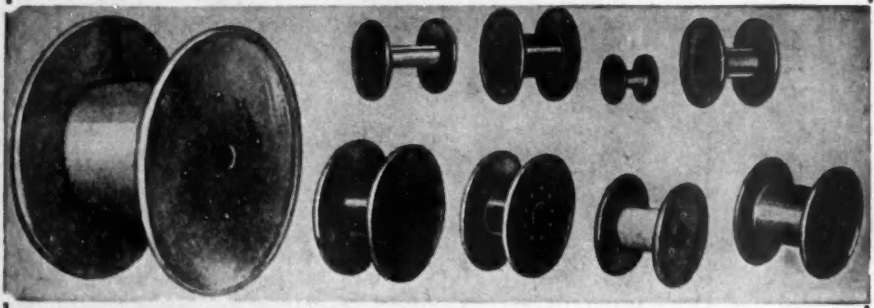

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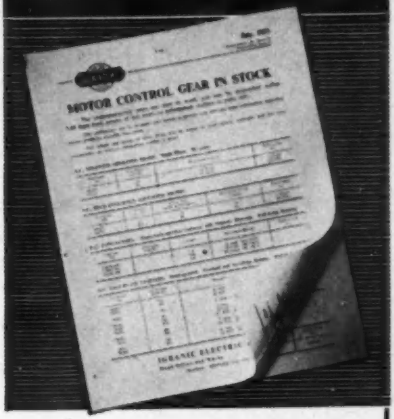

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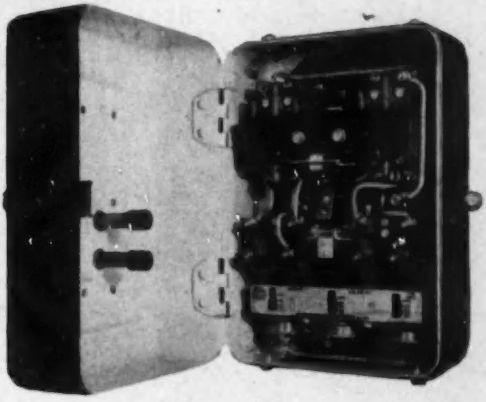

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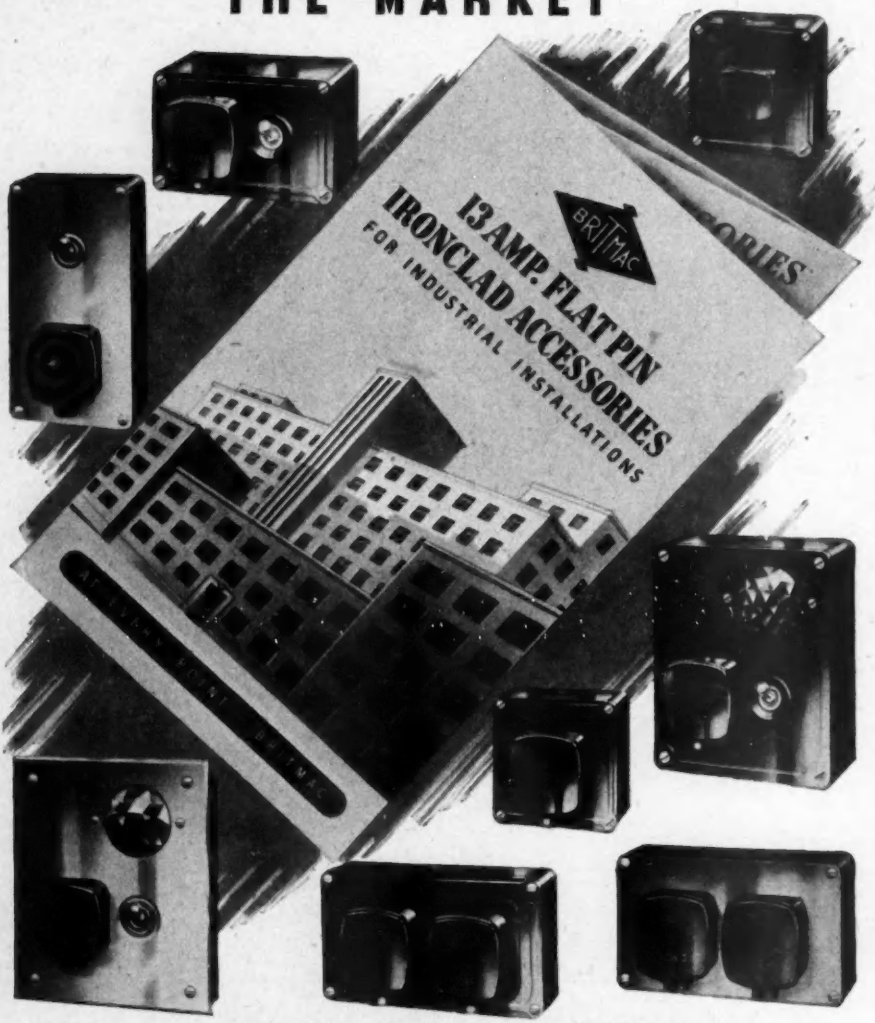

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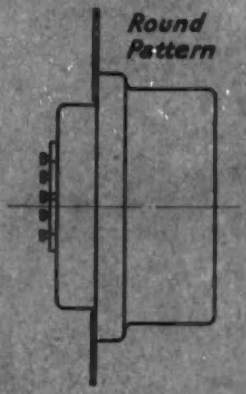

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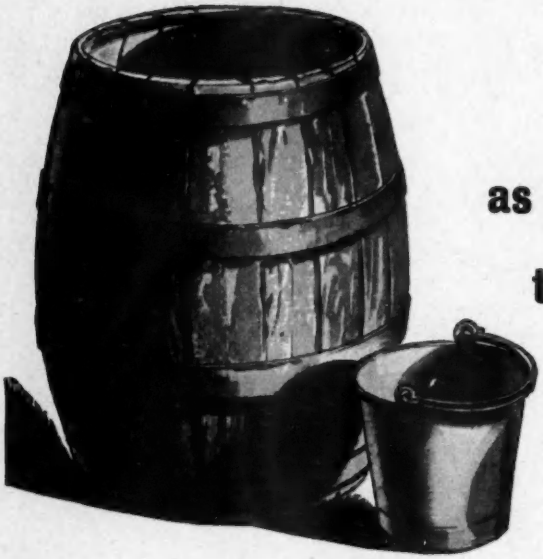

as a butt is

to a bucket . . .

— so is a GENERAL V.I.R. lead-sheathed and armoured cable to a GENERAL cotton-and-silk Flexible. And these are merely two of the wide range of cables manufactured by GENERAL for every job of carrying electric current. In the matter of capacity, GENERAL CABLES have not only *all* the answers but the right ones . . . cables of quality, strength and durability justifying our claim that " General Cables today prevent trouble tomorrow."

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The "Fanfare" kettle

with the musical 4-reed alarm. A fast-heating appliance of gleaming elegance which will grace any home—that's the BEST "Fanfare" kettle. But it's not enough to see it—you must *hear* its pleasant warning chord when the water boils. Capacity 4 pints. Streamlined body of stout copper, polished chromium finish. Bakelite non-conducting handle. Safety thumb-flick spout cap. All parts easily replaceable. 1500 watt loading. BEST element with automatic safety connector-ejector. 100/120, 200/220, 230/250 volts AC/DC. *Send for leaflet No. 23 for full details and prices.*

THE 'BEST' COFFEE PERCOLATOR

This superb example of BEST craftsmanship has a special "keep hot" device and automatic safety cut-out for the heater. Capacity 2½ pints. Percolation is practically instantaneous. Elegantly wrought in heavy-gauge copper, finished in polished chrome. Loading 500 watts. 100/120, 200/220, 230/250 volts, AC only. *Send for leaflet No. 17 for full details and prices.*

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This elegant appliance, with its chromium-plated repoussé finish on solid copper, distinguishes any table. Insulated feet protect even the most highly polished surfaces. Fitted with BEST element with safety connector-ejector. Capacity 2 pints (700 watts), or 4 pints (1,250 watts), voltages as for kettles above, for AC/DC. *Send for leaflet No. 22 for full details and prices.*

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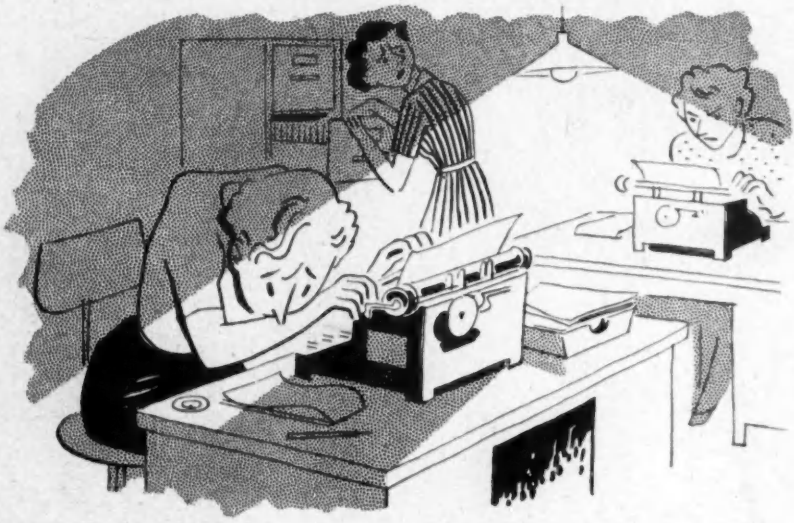

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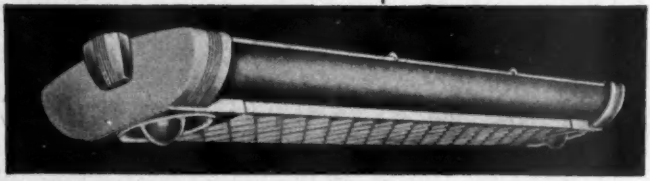

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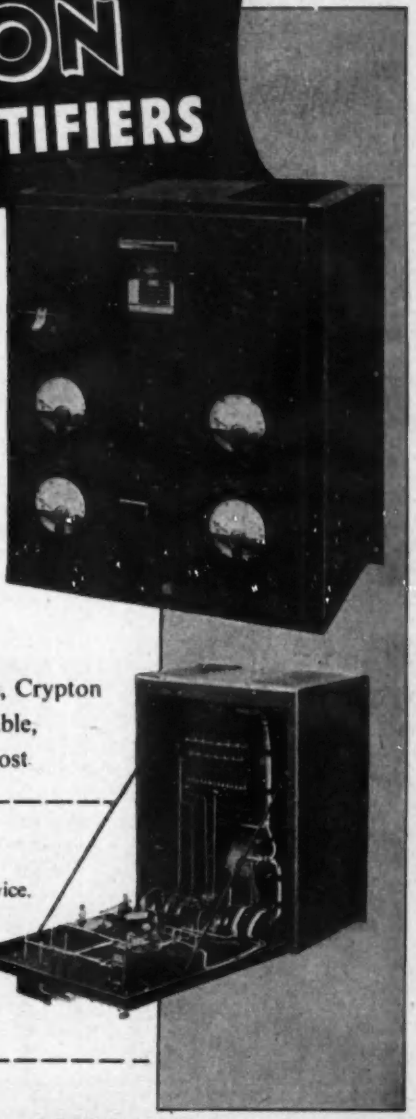

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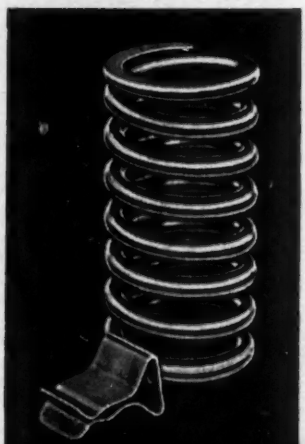

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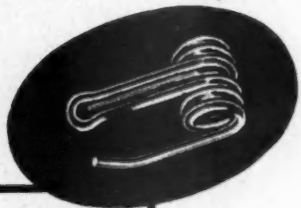

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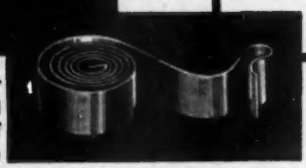

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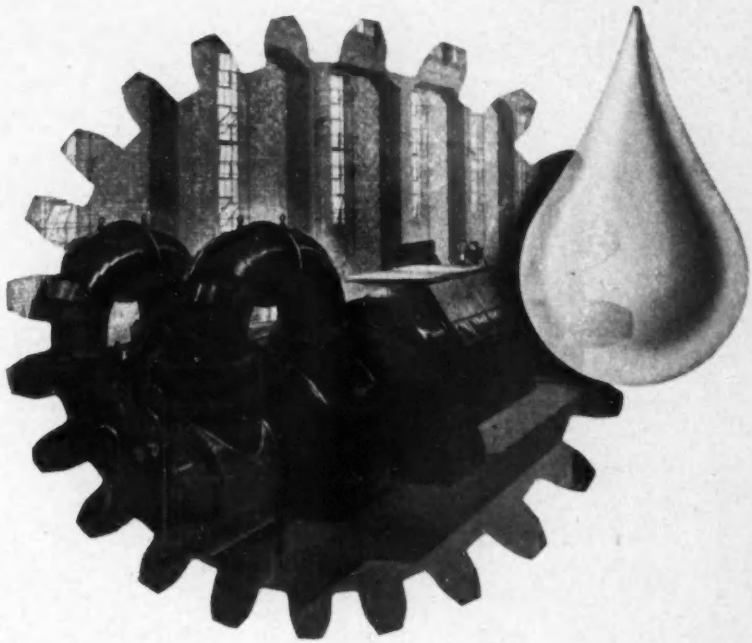

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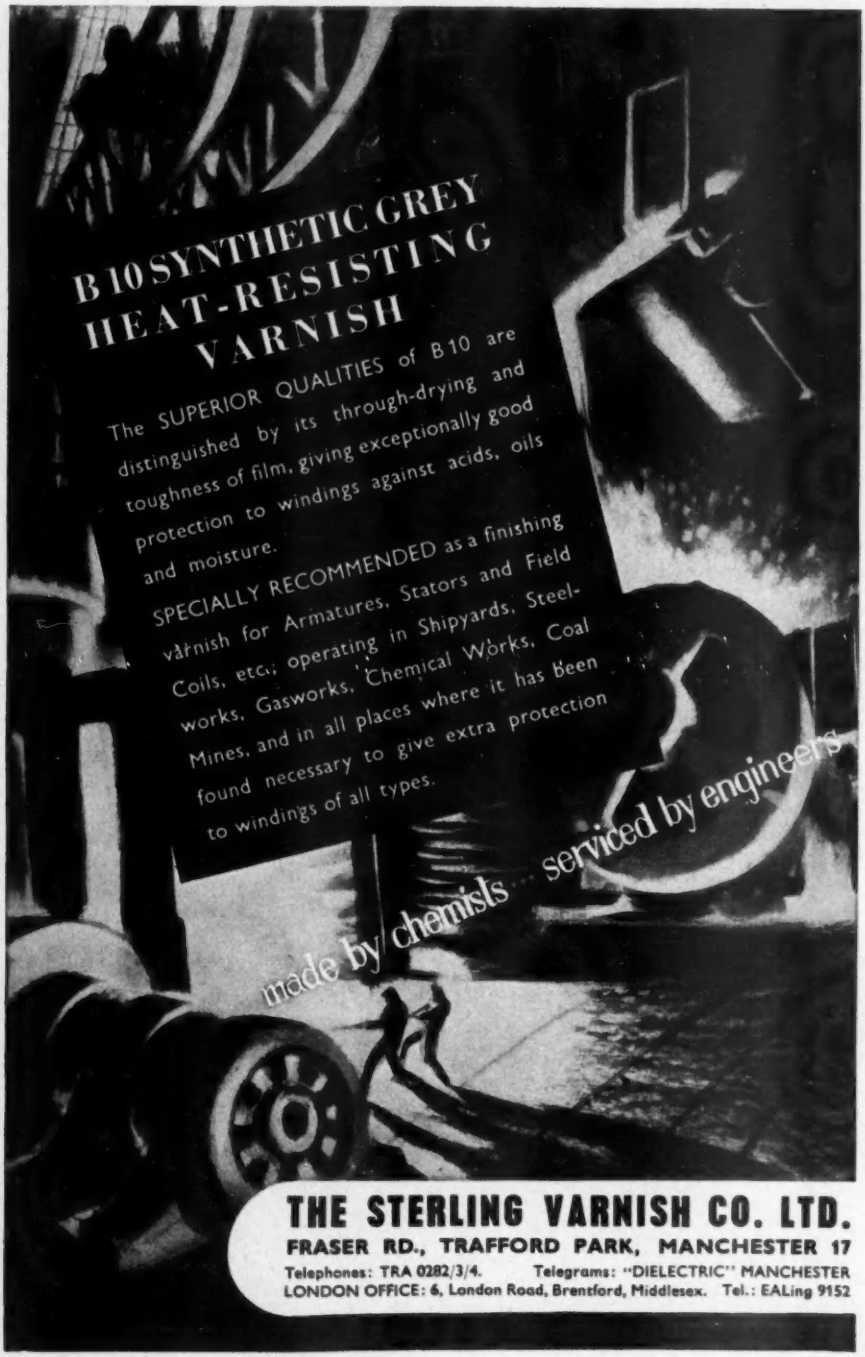
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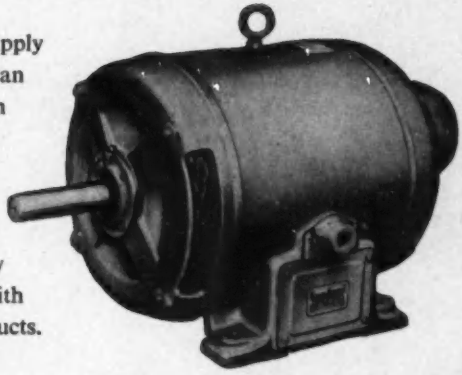

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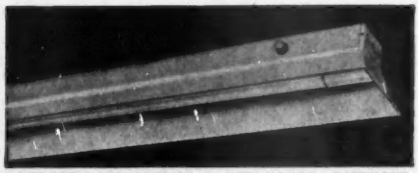

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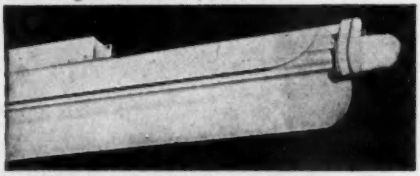

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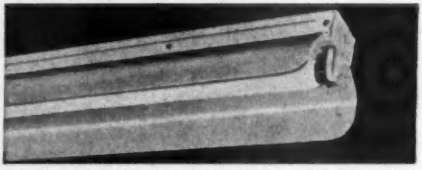

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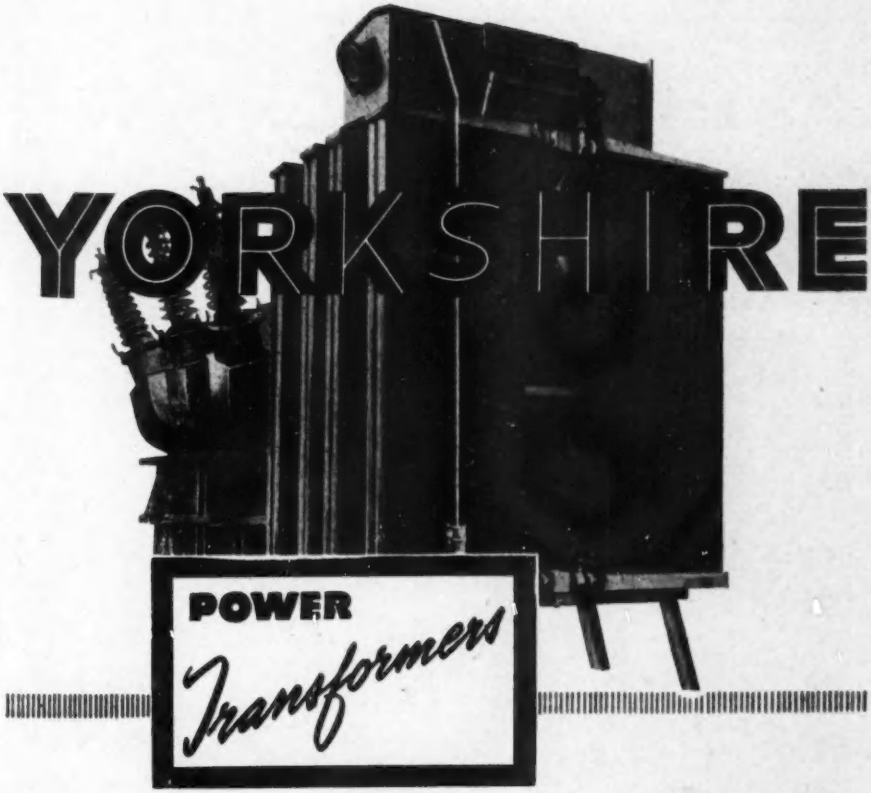

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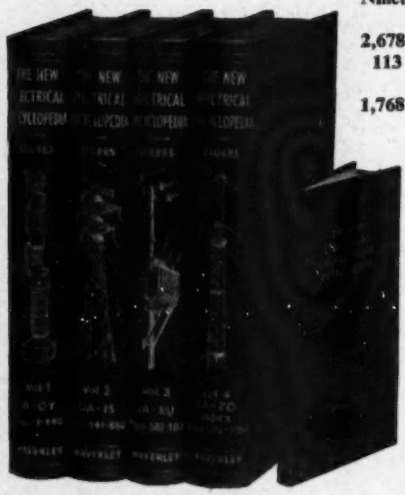

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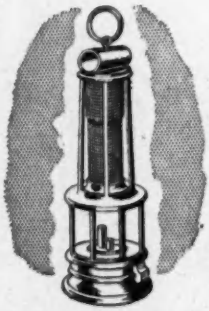

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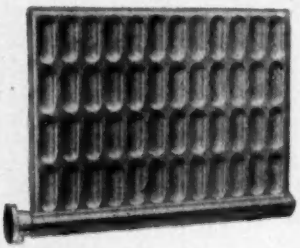

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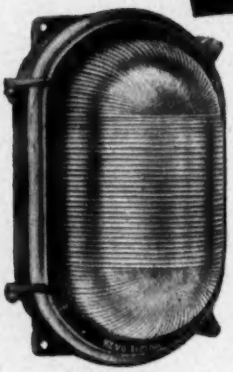

(Left)
C13558—A weather-proof Bulkhead fitting in aluminium alloy with smooth surfaced prismatic glass for 60w—100w lamps.

Revo Flameproof fittings, similar to that shown above, illuminate the roadway in Peckfield Colliery *(left)*

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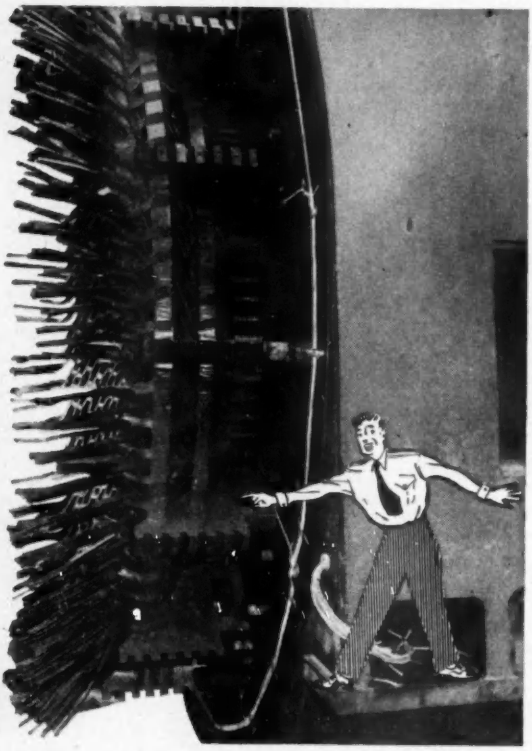
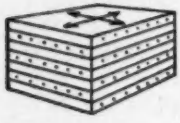


30mW. 22kV. 50 cycle frequency changer in course of construction showing Permali Grade EH67 End Winding support brackets and rings. Photo by courtesy of The English Electric Co. Limited

. . insulate with

PERMALI



All " Permali " parts have strength " built-in " as required by suitable arrangement of fibre direction during manufacture. TYPE 6 PERMALI, for instance, has the grain of adjacent laminations at right angles and is recommended for the manufacture of complex parts requiring equal strength in all directions.

Write for Data Book C/F 24 to:

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Telephone: Gloucester 24941 *Telegrams: "NICO, Gloucester"*

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Tel.: Abbey 6494

BIRMINGHAM (4)
270 Corporation Street
Tel.: Central 5584

MANCHESTER (3)
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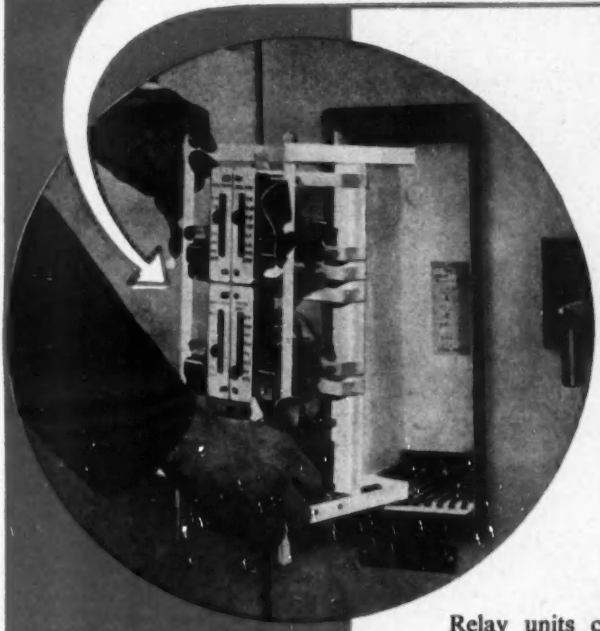
DRAWOUT RELAYS



Relay units can be completely withdrawn during actual service without disturbing any panel wiring or interfering with other devices.
Absolutely reliable contact surfaces.

'ENGLISH ELECTRIC'

protective and auxiliary relays

THE ENGLISH ELECTRIC COMPANY LTD., Queens House, Kingsway, London, W.C.2
Relay Department, Stafford.

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

IMR. 24L3

See the English Electric advertisement for Industrial Motors which appears on page 3 of this issue

Model 8

UNIVERSAL AVOMETER

20,000 ohms per volt *plus*

AUTOMATIC Overload Protection

Produced in response to a demand for a **high sensitivity** version of the world-famous Universal AvoMeter, this model incorporates the traditional design features of its predecessors, so highly valued for simplicity of operation and compact portability. It has a sensitivity of 20,000 ohms per volt on all D.C. voltage ranges and 1,000 ohms per volt on A.C. ranges from 100 V upwards. A decibel scale is provided for audiofrequency tests. In addition, a press button has been incorporated which reverses the direction of current through the moving coil, and thus obviates the inconvenience of changing over test leads when the current direction reverses. It also simplifies the testing of potentials both positive and negative about a common reference point.

A wide range of resistance measurements can be made using internal batteries, separate zero adjustment being provided for each range.

It is of importance to note that this model incorporates the "AVO" automatic cut-out for protection against inadvertent overloads.

Sizes: 8½ in. x 7½ in. x 4½ in.
Weight: 6½ lbs. (including leads).

£23 : 10s.

The following accessories are available to widen still further the ranges of the instrument: a Resistance Range Extension Unit to extend the limits of measurement from 0.025 ohm to 200 MΩ, a 10 kV D.C. multiplier and a number of A.C. current transformers.

D.C. VOLTAGE	D.C. CURRENT	A.C. VOLTAGE	A.C. CURRENT	RESISTANCE
2.5 V	50μA	2.5 V	100 mA	First indication 0.5Ω
10 V	250μA	10 V	1 A	Maximum indication 20MΩ
25 V	1 mA	25 V	2.5 A	0-2,000Ω
100 V	10 mA	100 V	10 A	0-200,000Ω } using internal batteries
250 V	100 mA	250 V		0-20 MΩ
1,000 V	1 A	1,000 V		using external batteries
2,500 V	10 A	2,500 V		0-200 MΩ

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINDER HOUSE • DOUGLAS STREET • LONDON S.W.1 Telephone VICtoria 3404—9

AB/1

New Premises?
- then specify
Standard
rubber, plastic & textile
insulated
CABLES
- for use anywhere in the world

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48, North Row, Park Lane, London: W.1.
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Works: Corporation Rd, Newport, Monmouthshire, Newport 72281

REPRESENTATIVES & WAREHOUSES: Birmingham, Bristol, Dublin, Glasgow, London, Leeds, Liverpool, Manchester, Newcastle, Newport, Belfast (A. W. Gordon Ltd. Agent)

Electrify production—

use G.E.C.

ELECTRIC Process Heating

FURNACES · INFRA RED · HIGH FREQUENCY

● **Bold thinking about bigger production demands new methods of heat treatment. G.E.C. *electric* process heating ensures maximum output and true economy. The many heating equipments in its range are clean, safe, simple to operate and heat rapidly to constant, correct and controlled temperatures. Its versatility is being proved every day.**

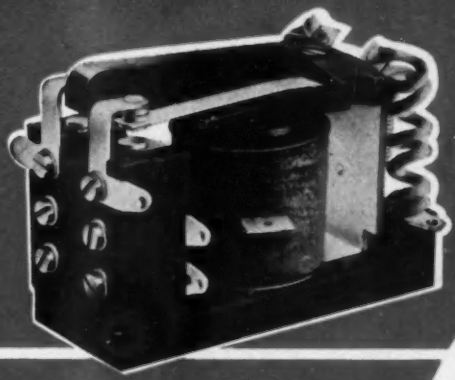
● **It is widely used in heavy and light industry, and a typical example of its versatility is shown here.**

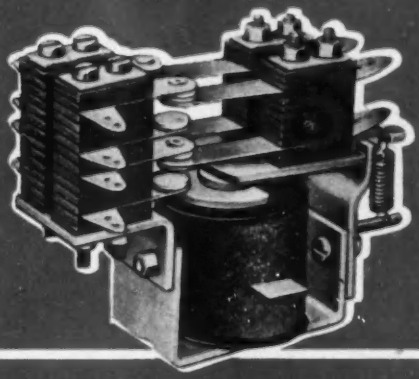
● **G.E.C. has had many years' experience in the design and construction of heating plant. The Company's specialists welcome opportunities to discuss potential uses.**

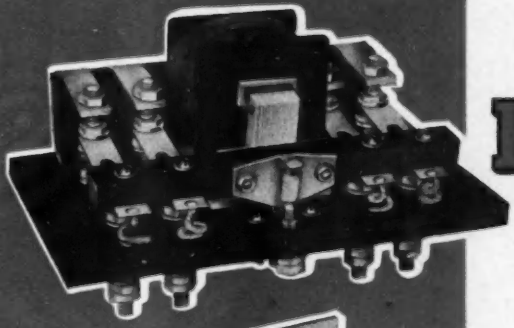
High Frequency Heating

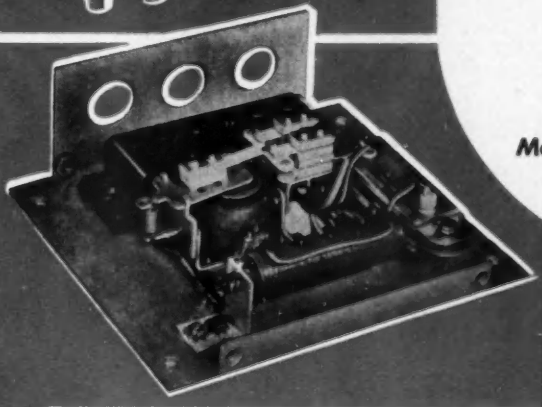
The G.E.C. 2 KW INDUCTION HEATER **has many features which make it eminently suitable for a wide range of applications, including the hardening of small parts, soldering and brazing. A typical instance of its value is illustrated above. When a gas flame was used to braze the box yoke, the spread of heat caused such distortion that it was necessary to mill the top face and to redrill the holes. Both these operations were avoided by using G.E.C. H.F. Induction Heating, and output was increased by 280%**

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C









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OF STEVENAGE

—the first name for precision RELAYS

Comprehensive technical data of our extensive range of standard relays will be forwarded on request.

Most types now available for PROMPT DELIVERY

ELECTRO METHODS LTD. (Division SR5) · CAXTON WAY · STEVENAGE · HERTS
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EXTRUSION COMPOUNDS

Vinyl compounds for many electrical and industrial applications including cable covering, sealing strips, hose, etc.

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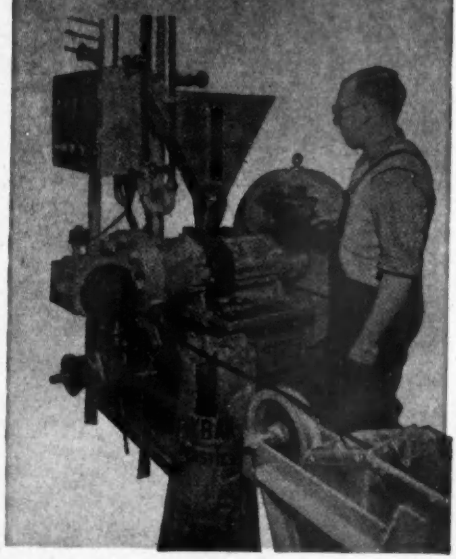

VYBAK Plastics

Write or 'phone for samples and data or call at

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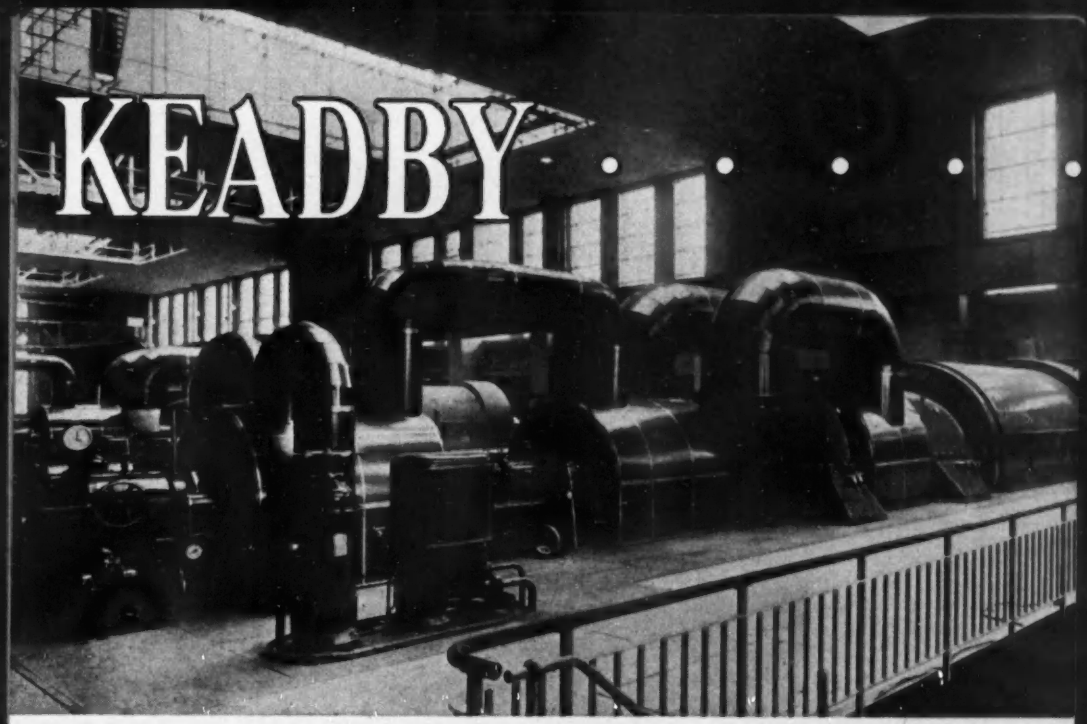
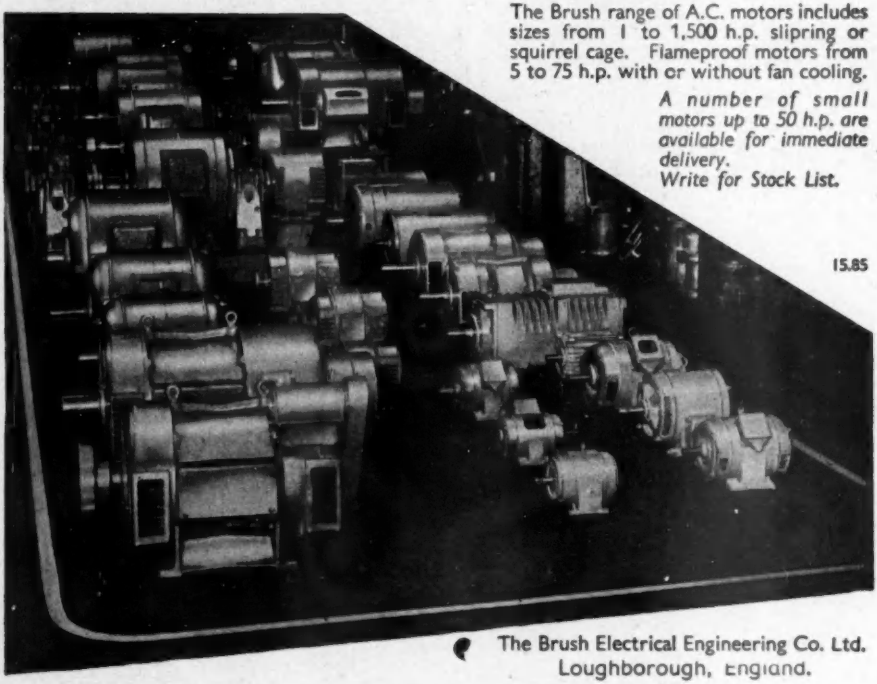


HYDROGEN COOLED TURBO-GENERATORS

C. A. PARSONS & Co. LTD
HEATON WORKS · NEWCASTLE UPON TYNE, 6

" When you've had as much experience of buying ***electric motors*** *as I have, you'll remember my saying . . .*

the best answer is **BRUSH** *"*



The Brush range of A.C. motors includes sizes from 1 to 1,500 h.p. slipring or squirrel cage. Flameproof motors from 5 to 75 h.p. with or without fan cooling.

A number of small motors up to 50 h.p. are available for immediate delivery.
Write for Stock List.

15.85

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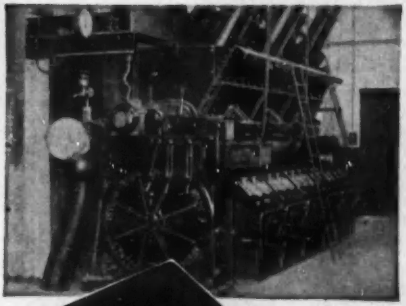
In power stations

Firing aisle showing twin 'L' stokers at an Electricity Generating Station.

Small 'L' stoker installation at Monsanto Chemical Works.



and in factories

ICL ENTERPRISING ENGINEERING

Saves coal

INTERNATIONAL COMBUSTION LIMITED. *London Office: Nineteen Woburn Place, W.C.1*

Works: Derby, England; Port Elizabeth, South Africa; Sydney, Australia.

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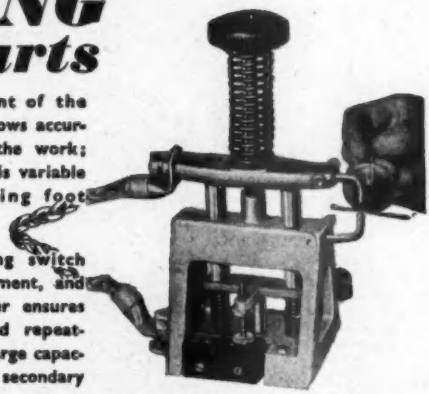
For WELDING small parts

Vertical movement of the upper electrode allows accurate alignment of the work; electrode pressure is variable without increasing foot pressure.

The pilot initiating switch has a micro-adjustment, and the electronic timer ensures accurate, high-speed repeat-performance. The large capacity transformer is secondary tapped.



Miniature Spot Welder **WPOS**

SIEMENS-SCHUCKERT

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FARADAY WORKS · GREAT WEST ROAD · BRENTFORD · MIDDLESEX

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Smee's 5.68

FAIR PLAY

SWITCH BLOCKS

built of* KILN DRIED *timber

STAY FLAT

AND CORRECT SHAPE

We invite your enquiries

WOOTTON & CO. LTD.

ALMA WORKS, PONDERS END

MIDDLESEX

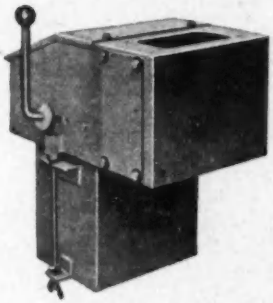
TELEPHONE: HOWARD 1850

L3891D

TYPE TESTED

OIL CIRCUIT BREAKERS

UP TO 25 MVA

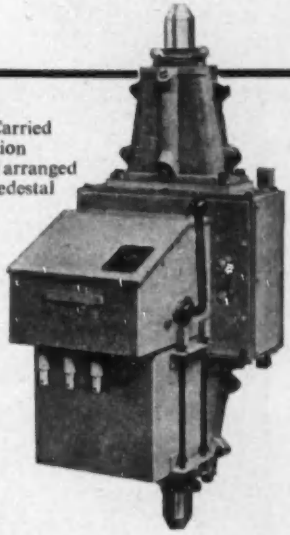


Pattern D : For wall or pedestal mounting, or for mounting below a Busbar Chamber.

The Oil Circuit Breakers are generously designed to comply with B.S.S.936/40 for 440 volts A.C.

Illustrated catalogues will be forwarded on request.

Pattern B: Carried on a connection chamber and arranged for wall or pedestal mounting.



OTTER MILL SWITCHGEAR

G. M. ENGINEERING

(OTTERY ST MARY) LIMITED

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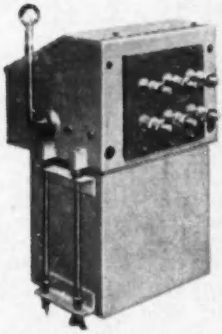
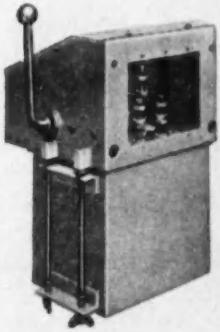
Telephone: Abbey 5095 Telegrams: Busbar, Sowest

For Switchboard and Cubicle mounting.

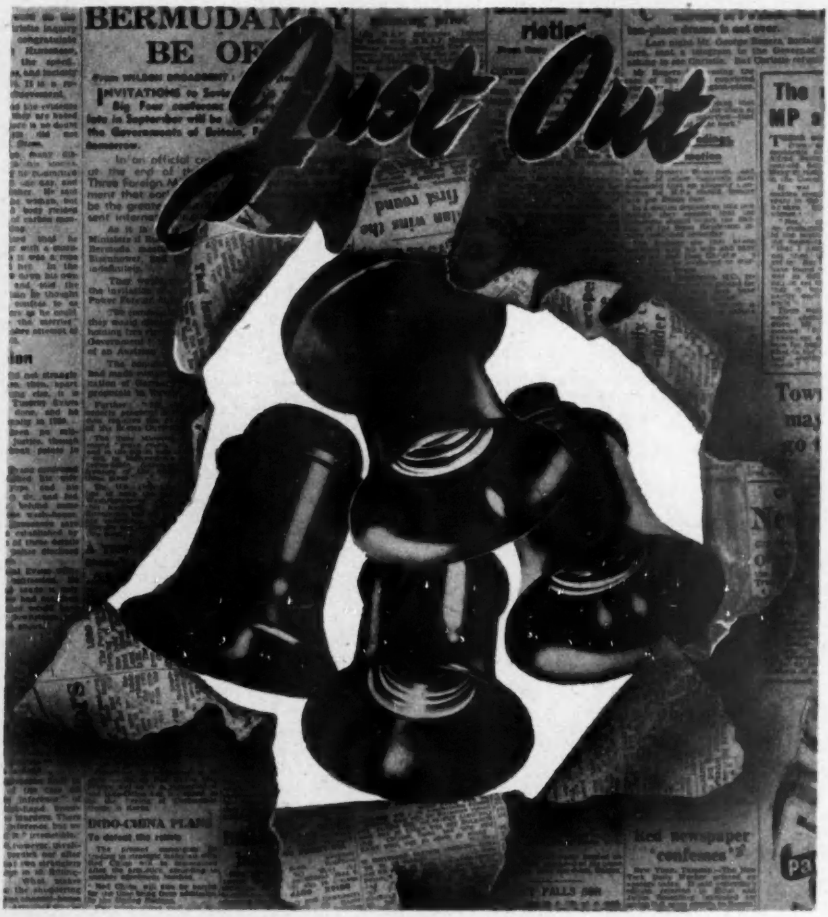
Pattern A: With horizontal draw-out device, and back stems.



Pattern B: Non draw-out type with back stems.



Pattern C: Non draw-out type with rear aperture.



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"QUALITY" EDISON SCREW LAMPHOLDERS

for Competitive Installations

This new range of Edison Screw Lampholders incorporates Porcelain interiors and moulded bakelite cases.

The lampholders have been designed to comply with standards operating in both British and Continental markets. Note:—Deep, Bell-mouthed Skirt for Safety.

Range includes cord grip, batten fixing and screwed cap in $\frac{3}{8}$" Brass, $\frac{1}{2}$" Brass, 10 mm., 13 mm., and $\frac{5}{8}$" Conduit Thread.

THE KERSONS MANUFACTURING COMPANY LIMITED

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SPECIFICATION T.1
OR TO CUSTOMERS OWN REQUIREMENTS

G.E.C. TRANSFORMERS

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Oh boy, Metro!

METROPOLITAN
Electric Cables

MAKE YOURS METRO TOO!

THE METROPOLITAN ELECTRIC CABLE AND CONSTRUCTION CO. LTD.

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No.A.4

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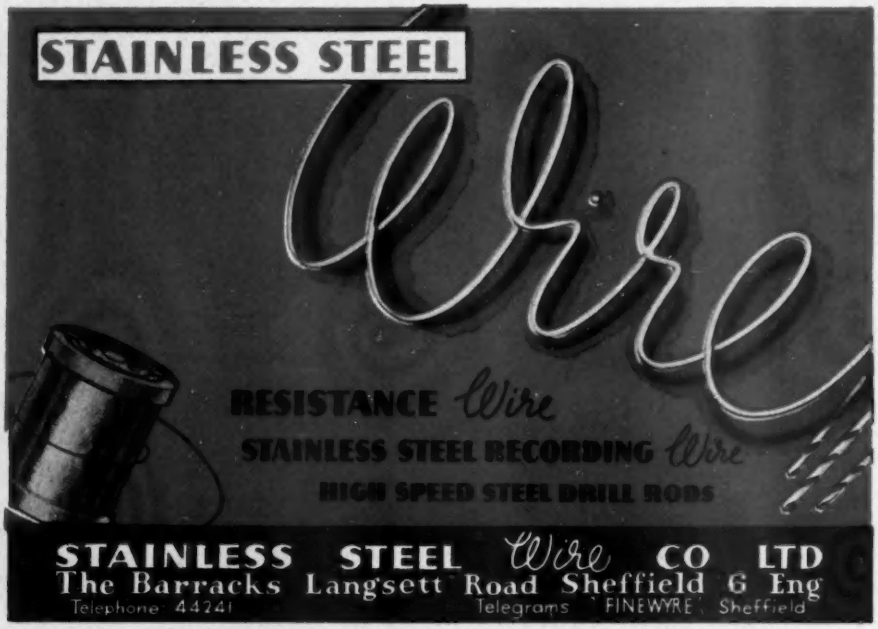
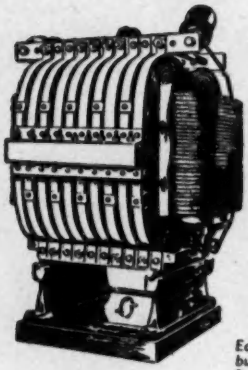
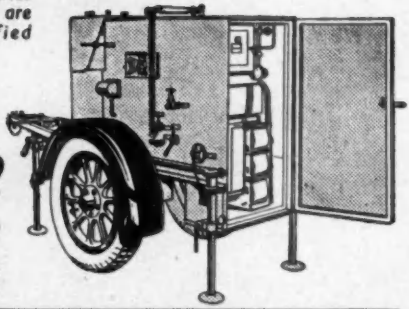




The first Transformers created a problem . . .

Oil-immersed Transformers and Switchgear were essential to the advance of electricity by permitting heavier loads to be carried by smaller conductors, but for their efficient operation the oil must be maintained at the highest standard of purity, dryness and insulating capacity. For the past 30 years Streamline Filters have ensured the safety and efficiency of transformers and switchgear in 62 countries of the world. There are over 40,000 satisfied users.

Early Ferranti transformer built in 1891 now in the Science Museum, S. Kensington



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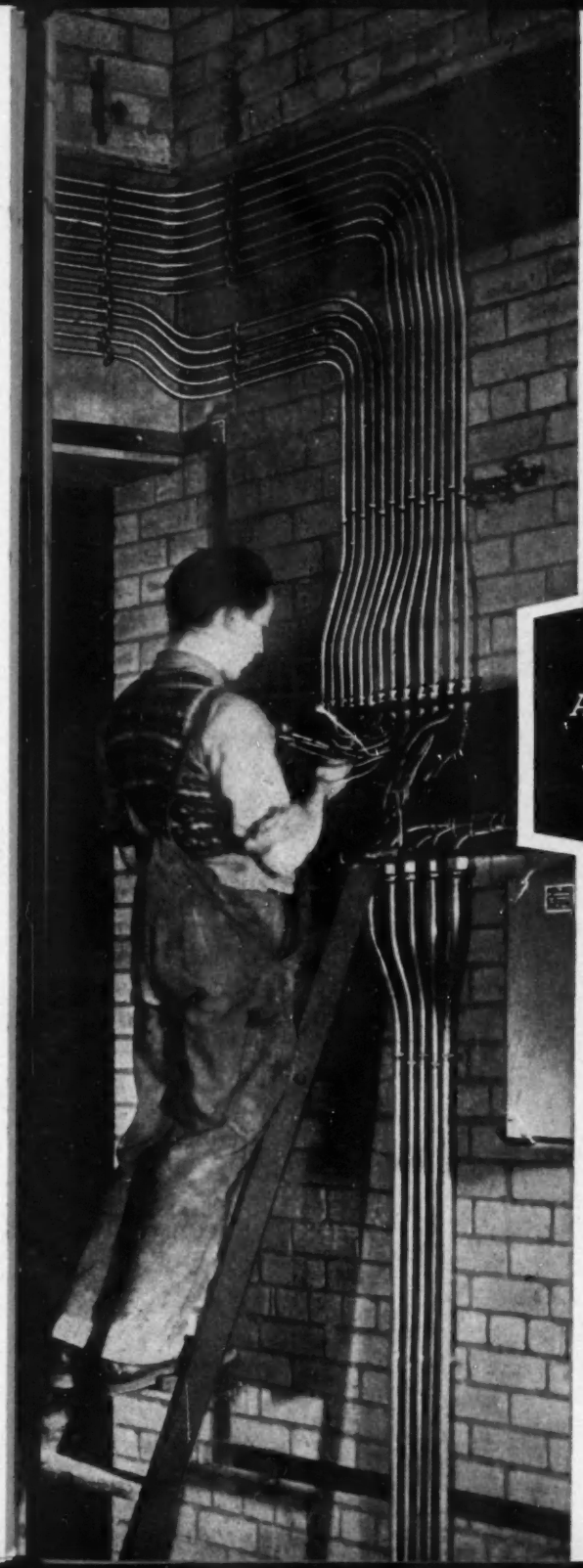

SO EASY
to install

SO ATTRACTIVE
in appearance

and yet...
SO RESISTANT
TO DAMAGE

J. & P.
ALUMINIUM SHEATHED
WIRING CABLE

. . . the cable with a conduit sheath

British Patent Nos. 627815 & 627793

For cabling where there is a risk of mechanical damage, aluminium sheathed wiring cable has many installation advantages over alternative systems.

1. The cable can be readily bent by hand to the requirements of the installation, yet it retains a neat and attractive appearance.
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3. The vulcanised rubber insulation does not readily absorb moisture and no special precautions need be taken during installation.
4. The use of stranded conductors reduces the risk of fracture.

Photograph taken in the B.E.A.'s new generating station at Carmarthen Bay.
Contractors: Messrs. R. Alger & Sons Ltd.
Newport, Mon.

JOHNSON & PHILLIPS LTD.
CHARLTON · LONDON · S.E.7

ELECTRICAL ENGINEERS
AND CABLE MAKERS SINCE 1875

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WEATHERPROOF METAL-CLAD MULTIPLE SOCKETS AND TEES

Designs to requirements

For Electric Lighting Installations and Power Transmission, Communication, Portable Tools, etc.

3-Way Tee and Covers
Diagram for Temporary Lighting with Fittings connected to 6-Way Tee
3-Way Multiple Socket and Covers
6-Way Tee and Covers

SIMMONDS & STOKES (NIPHAN) LTD

MANUFACTURING ELECTRICAL ENGINEERS

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The small fuse with *BIG* advantages

- Will withstand extremes of temperature.
- Can be fixed into the most awkward positions.
- Positive contacts—to ensure perfect continuity.
- Cable connections available for every requirement.
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- Vibration and shock proof.
- Available 5-60 amp. and 15-100 amp.

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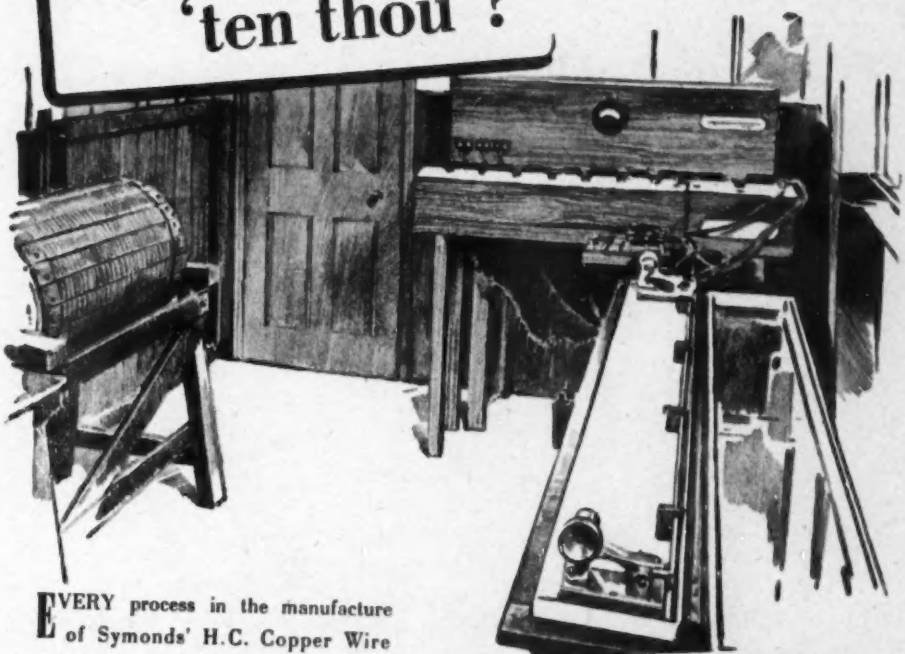
ENQUIRIES WELCOMED. *Tel. WYTHenshawe 2235/6/7. Grams. 'Slydlox' Manchester.*

dm EW49

How thick is 'ten thou'?



EVERY process in the manufacture of Symonds' H.C. Copper Wire and Strip is carried out with a care and skill which has earned them their fine name among Cable Manufacturers and other users of their materials.

A VIEW OF THE TESTING ROOM OF R. H. SYMONDS LTD SHOWING A BRIDGE ON WHICH THE CONDUCTIVITY OF COPPER IS TESTED TO THE FINEST LIMITS POSSIBLE.

R. H. SYMONDS LTD

Manufacturers of: H. C. Copper Wire, Soft and Hard drawn, Plain and Tinned.
H. C. Copper Strip, Soft Plain and Hard drawn.

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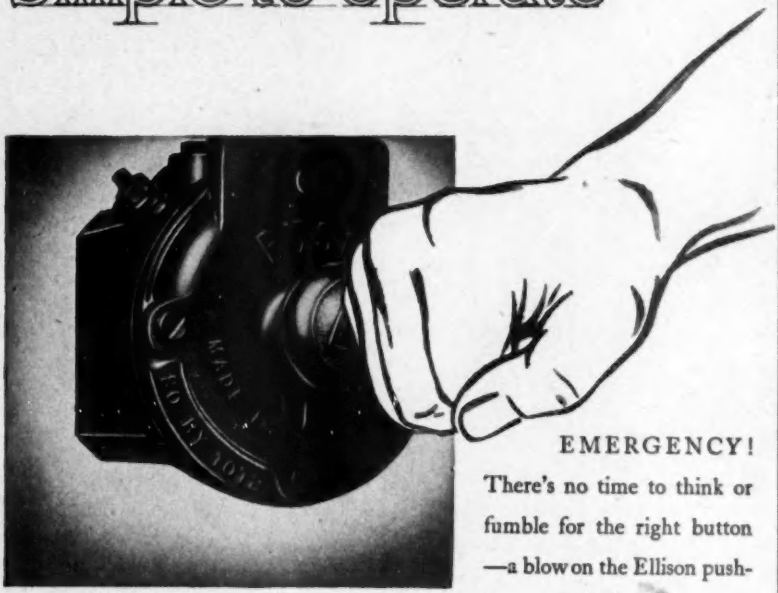
It's a point of good design... 17

ELLISON EMERGENCY SWITCHES ARE

Simple to operate



EMERGENCY!

There's no time to think or fumble for the right button —a blow on the Ellison push-knob stops the electric motor. Simple operation — simple mechanism—that's the switch for an emergency.

List No. 11 will tell you more about the Ellison Emergency Switch—send for a copy.

YOU CAN RELY ON AN ELLISON PRODUCT
Regd. Trade Mark

GEORGE ELLISON
LIMITED
BIRMINGHAM ENGLAND

717

ELECTRICAL TIMES

Volume 124 No. 3238 26 NOVEMBER, 1953

PUBLISHED EVERY THURSDAY

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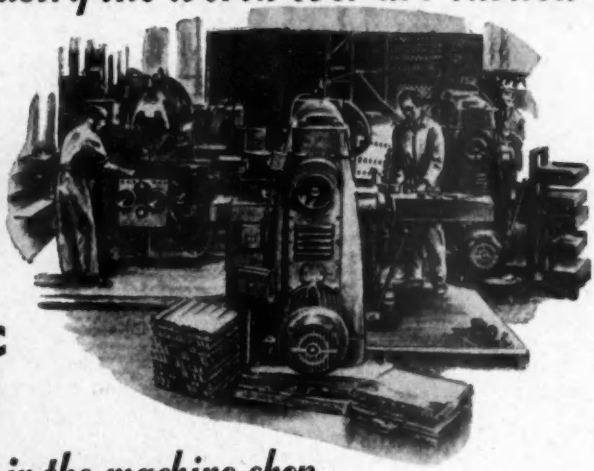

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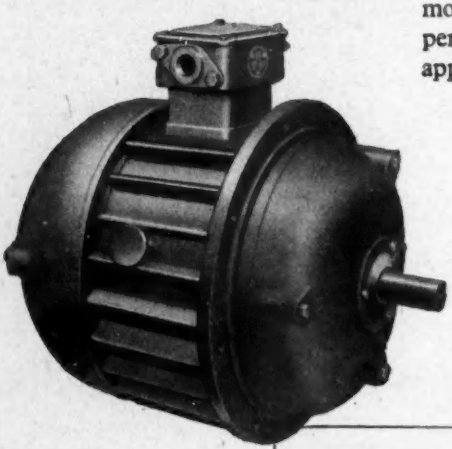

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Editorial

DWINDLING OPENCAST

AS December approaches, and with it expectation of the worst of the winter, it is evident that Mr. Geoffrey Lloyd has again benefited from warm weather at the right time, so maintaining the luck which has been specified as the first requirement of a successful fuel minister. Power station coal stocks have risen through October and November, and the immediate margin of safety against winter breakdown is indeed comfortable. Yet although this is satisfactory enough from the short-term viewpoint, there are ominous signs in the coal statistics that all is not well. Saleable stocks of opencast coal in N.C.B. hands have been drawn down by 2m. tons since last year, and have now fallen to a total of 0·5m. tons. This reservoir of supplies has played an important part in the achievement of the present satisfactory power station stock position, and soon it will be exhausted. When this has happened, the industry is likely to feel the effects of the 2½m. ton drop in overall production which is the coal industry's sorry record so far this year. Warm weather in October and November cannot disguise the long term threat inherent in this situation.

WHENCE THE ENGINEERS?

EVERYONE agrees that we need more engineers. Even the headmasters of grammar and public schools are convinced of that. Yet those same gentlemen, together with their career masters, are proving difficult to convince that their pupils should supply that need, and that they should guide their steps in that direction. Their obtuseness in this respect was recently stated by Lord Simon of Wythenshawe to be the most serious bottleneck in the whole problem of increasing the supply of technologists, and his opinion in this respect reinforces what has been the experience of those particularly interested in recruiting for electrical engineering. One of the troubles is that the teachers know very little about engineering as a profession, and have their ideas thoroughly mixed concerning the status of the qualified engineer in industry. There is a need here for those who have succeeded in the industry to practice a little missionary work. In their contacts with former masters and with their children's present teachers they should make it their business to pass on information on the opportunities of the engineer and his importance. Though they may feel somewhat cynical on the subject, the cumulative effect on recruiting of taking the trouble to carry out such a self-appointed task could well be considerable. Such success would be entirely to the advantage of the industry as a whole, and so in some degree to the engineers themselves.

LIGHTING VALUES

FLUORESCENT lamps offer two valuable advantages for street-lighting: high luminous efficiency and natural colour rendering. Unfortunately this latter property is tending in some ways to delay the extension of this latest lighting technique. Just because the colour properties are so much better than those of other discharge lamps, any proposal to adopt high-first-cost fluorescent lighting equipment is liable to be attacked as self-evident civic indulgence. This attitude has on occasion appeared to be the reaction of the Ministry of Transport, which is intimately interested in the question because its grants help fill the bill for so many main road lighting installations today. But good appearance is only one of several attractive technical and aesthetic qualities offered by fluorescent street-lighting, as an article on a later page points out. Moreover, the financial drawback of high capital cost is to a considerable degree

offset by corresponding advantages of lower maintenance and replacement costs. Taking all the factors together the statement that fluorescent street-lighting is too expensive seems considerably over-simplified, and difficult to sustain even in these days of extreme concern with the limitation of capital expenditure.

MUZZLED?

CONGRATULATIONS once more, to the hard working and tenacious representatives of the solid fuel industry! At the first sign of a resurgence of aggressiveness in electrical selling, they have by the air of righteous indignation and pained surprise manoeuvred the Minister of Fuel and Power into publicly rebuking the B.E.A. for alleged misrepresentations about fuel comparisons, made in an E.D.A. pamphlet. All this because E.D.A. said electricity is best. The whole affair provides an object lesson in alertness and swift reaction for the electricity industry, which let pass unchallenged when they first appeared, the exaggerations of solid fuel publicists, so ensuring that they should become fixed as unquestioned facts in the public mind. But the future is the thing. Even while taking the B.E.A. to task, the Minister felt compelled to say that he could not restrain them from promotional activities in the public interest. There is the green light for E.D.A. again. They must not be deterred by official complaints, but must attack with redoubled energy the task of securing true public appreciation of the Facts about Fuel.

SEEING SPARKS

COMMUTATION is one of the relatively few electrical processes which seem to work better in practice than elementary theory might suggest. That its problems are none the less numerous no one who has operated a.c. commutator machines will deny, and even those whose experience is confined to direct current motors will find little difficulty in agreeing that commutation can on occasion be both perplexing and mysterious. Yet in spite of all this interest, and the universal aim of securing the "sparkless commutation" of which instruction manuals speak, judgment of commutation smoothness seems to have remained no more than a subjective matter for the machine operator and the test engineer. This point was raised to some effect in an I.E.E. discussion on aircraft generators last week, when it appeared that no one in the audience had reached the stage of developing a discriminating circuit for determining objectively when commutation is indeed sparkless. Various techniques of course suggest themselves, notably some form of radio interference type detector, but it is by no means certain that any have actually been built. It would be interesting to know if any appropriate instrument has indeed been produced, or if checking sparkless commutation remains like designing for that condition, rather more of an art than a science.

UNKNOWN ECONOMIES

IT is nearly a year ago that the I.E.E. authorised temporary relaxations to the Wiring Regulations, re-introducing what had been War Emergency current ratings for the smaller v.r.i. and similar cables. Yet we have only to include in our pages some innocent statement about "3/·029 v.r.i. rated at 10 amps" for readers to telephone us with well-intentional reminders that the 12th Edition of the Wiring Rules says 5 amps. This was once true; but the Temporary Relaxation has now altered Table 5. From our experience, it would appear that this is less widely known than should be the case. It makes one wonder, indeed, how far the original aim of those who proposed the relaxation economy in building materials is in fact being achieved. No doubt price-conscious contractors make full use of the higher ratings that are now permitted, but we suspect that many other engineers, less immediately concerned with cost, are still putting unnecessarily heavy copper sections into their circuits. They should check up on the question at once, and paste that green revision slip over Table 5 of their well-thumbed copy of the Wiring Regulations.

Meteor

Is Fluorescent Street Lighting Expensive?

by H. W. WESTON*
and J. T. GRUNDY

SO much has been said by so many interested authorities on the question of efficient street lighting, that the fundamentals of the subject tend to become somewhat obscured. Far too often the cry of "cost" is heard, whilst those who view progress with suspicion harp on the "good enough" qualities of outmoded systems.

Much depends upon one's idea of the purpose of street lighting, of course. If it is merely to light up a roadway, then any sort of illumination will suffice, and the cheaper the installation the better. Street lighting, however, surely means more than this. Its primary function is to permit quick, comfortable and accurate seeing after dark—not merely for the sake of seeing, but in order to reduce the heavy toll of traffic accidents and loss of life. For this humanitarian reason alone, the consideration of "cost" and "makeshift lighting" should be of secondary importance.

Safety Considerations

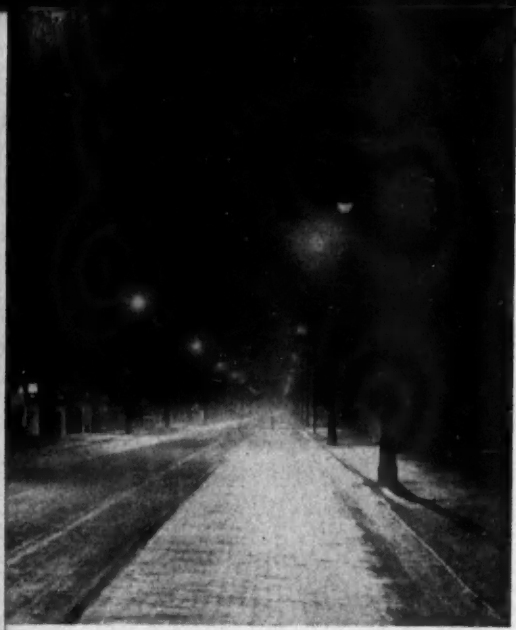
Few accidents can be prevented by simply providing a "good enough" light for the motorist. In the city the pedestrian too, must be considered—especially in respect of comfortable and accurate visibility. Whether this can be best achieved by incandescent, mercury vapour, sodium or flourescent lamps may be a debatable point, but quick and accurate seeing is seldom possible if the source of illumination is uncomfortable.

Comfort depends upon an absence of glare, a natural colour rendering of the light source, and a large area of lamp brightness. Quite a number of motorists and pedestrians feel that the bluish light of a mercury vapour lamp or the yellow light of a sodium lamp is far from comfortable. Some think this is due to the "unnatural" colour of the light, while others complain of the glare from the small area of lamp brightness. In actual fact, light of a single wavelength—monochromatic light—eliminates the phenomenon known as chromatic aberration which slightly blurs the vision even in daylight, and objects can be seen more clearly in sodium light than in any other. And yet, a number of people still object to it. On the question of the glare of mercury and sodium, one must admit that the effect is cumulative. In other words, in a long straight road where a considerable number of light sources are in one's field of vision, glare can become objectionable as indicated in Fig. 2. Clearly the whole problem is quite complex, and much depends upon the individual's reaction; a certain amount of glare is unavoidable from any light source due to the contrast between the source and the dark surroundings of the night.

There can be no doubt that fluorescent lighting has come to stay. Skilfully installed, there is nothing to equal it for efficiency combined with lighting comfort—Fig. 3 exemplifies these factors. The large area and low brightness of the lamp, in addition to reduc-

Fig. 1. Above is seen a good example of vertical, wall-mounted lanterns—in King Street, City of London

* The Authors are with Siemens Electric Lamps and Supplies Ltd., to whom acknowledgement is made for the illustrations.



A remarkable contrast is made between the cumulative glare from lines of high intensity light sources, such as the mercury vapour lamp (left, Fig. 2) and the comfort of fluorescent lighting as shown by that in Moorgate, London (Fig. 3 right)

ing glare, also assists in overcoming annoying and disabling reflections from wet and greasy road surfaces. By suitable location of the lights in relation to the roadway, it is possible, within wide limits, to control the depth of shadow so that the required degree of contrast is obtained. Equally important from the view of vision comfort, is the colour rendering possible by the various types of fluorescent tubes.

A number of authorities have recognised the improved safety factor of fluorescent street lighting by installing or experimenting with various schemes such as vertically mounted lanterns (Fig. 1). Far too many, however, still view fluorescent lanterns as a kind of "luxury" and an expression of civic indulgence. Others quite frankly refer to cost.

Cost Comparisons

How exactly do these costs compare with tungsten, mercury, or sodium lighting? From the angle of initial capital expenditure, fluorescent lighting is undoubtedly more expensive—but mainly in one major respect. Due to the dimensions of a fluorescent tube, the lantern housing it is naturally more costly to produce than a sodium or mercury vapour lantern. There is, however, every sign that as new techniques are discovered and new designs come into being, this cost will be reduced. Even so, taking capital expenditure as it stands today, the possibilities of the system must be carefully considered. Not only does a fluorescent lighting scheme provide more comfortable vision and an improved safety factor, but it also allows for the research and development almost constantly being made in fluorescent tubes. Since this field of illumination is yet in its infancy, it follows that a fluorescent lighting scheme will have a considerably greater "long-term policy" than any other.

From the angle of operation and maintenance once installed, the fluorescent lamp is the most economical of any. With an average life five times that of tungsten, double that of mercury vapour, and nearly one and three-quarters that of sodium, the costs of replacement of lamps and associated labour

COSTS OF FLUORESCENT STREET LIGHTING

PERIOD (Quarter Year)	ANNUAL CHARGES									MAINTENANCE CHARGES		
	Energy			Coal Clause			Relay rentals			Total					
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
1 Oct. to 31 Dec., 1950	182	12	6	44	17	1	36	11	6	264	1	1	56	6	6
1 Jan. to 31 Mar., 1951	184	16	0	39	18	10	36	11	6	261	6	4	85	3	8
1 April to 30 June, 1951	184	16	0	21	12	7	36	11	6	243	0	1	47	9	9
1 July to 30 Sept., 1951	184	16	0	28	4	8	36	11	6	249	12	2	66	0	4
1 Oct. to 31 Dec., 1951	184	16	0	53	10	3	36	11	6	274	17	9	142	8	4
1 Jan. to 31 Mar., 1952*	184	16	0	47	2	3	36	11	6	268	9	9	145	4	9
1 April to 30 June, 1952†	242	12	0	3	1	7	36	11	6	282	5	1	120	0	5
1 July to 30 Sept., 1952	242	12	0	4	7	6	36	11	6	283	11	0	82	13	8
1 Oct. to 31 Dec., 1952	244	9	6	6	0	1	36	11	6	287	2	1	198	2	6
1 Jan. to 31 Mar., 1953	246	11	6	4	3	7	36	11	6	287	6	7	121	10	2
1 April to 30 June, 1953	248	12	2	3	14	4	36	11	6	288	18	0	73	2	11
1 July to 30 Sept., 1953	249	12	6	5	16	10	36	16	6	292	0	10	Not yet available.		

** Night Inspection ceased here.* *† Basic Tariff Increase. Coal Clause Reduction.*

charges are greatly reduced. Since two 80-watt fluorescent tubes will give a light output comparable to one 500-watt tungsten, one 250-watt mercury vapour, or one 140-watt sodium, the current consumption can, in some instances, be improved upon. Instead of quoting hypothetical figures on this question of costs, it is extremely interesting to see just how they have worked out in practice.

Audited Costs of Fluorescent

The following figures are taken from the audited costs of an Urban District Council where fluorescent street lighting has been installed for three years. This installation consists of 172 street lanterns utilising three 80 watt tubes/lantern. Of these lanterns, 159 are lit up from dusk until midnight and also at early morning. The remaining 13 are continuous burning from dusk until dawn.

The maintenance programme includes cleaning twice yearly—which has been found to be quite sufficient with the type of equipment used—and a twice weekly operational inspection during the winter months. During the summer, inspection once every fortnight was maintained.

For the period 1st January, 1951, to the 31st December, 1951, the total expenditure on maintenance — inclusive of materials, labour, transport and overheads — was £341 2s. 1d. The monthly average for 172 lamps was, therefore, £28 10s. approximately. The corresponding monthly average for the year 1st January, 1952, until 31st December, 1952, was £45 10s. and for the first six months of 1953 overall costs were £32 7s. Detailed annual charges for energy, coal clause, relay rentals and maintenance charges in this district are shown in the accompanying table.

It will be seen from these audited figures that fluorescent street lighting in practice is extremely economical. To the astute mind, able to appreciate the long term value of a slightly higher capital expenditure, the advantages will be obvious.

Quite recently for instance, the efficiencies of fluorescent tubes were considerably increased. Both normal switch start and instant start types now give 45 lumens/watt output (after 2,000 hours) instead of the previous figure of 40 lumens. The average efficiency over the first 5,000 hours of the life of a tube is, therefore, increased by 12½%. In terms of commercial advantage, such an improvement in output/tube will mean—especially in instances where a three-tube lantern is used—that normal re-lamping of existing installations will automatically bring about a valuable increase in illumination level. It is also quite logical to assume that continual research in fluorescent tube design and manufacture will eventually reduce the number of tubes required to produce a given level of illumination, which, in itself, will influence the cost of capital expenditure.

ANOTHER FUEL PLAN

Domestic Electrification and Tariff Structure Defended

PLANS for the more efficient use of the nation's fuel and power resources are plentiful at present. The most recent one has taken the form of a paper by Dr. F. M. H. Taylor, B.Sc., Ph.D., A.R.C.Sc., M.Inst.,F. (Managing Director, Thermocontrol Installations Ltd.), which was read before the Institute of Fuel on Tuesday. Unlike many similar surveys recently it comes down heavily on the side of what may be called enlightened freedom of choice.

Background to the fuel problem, suggests Dr. Taylor, is a failure to export enough by at least £300m per year. In this the shortage of coal has had both direct and indirect effects. It is noticeable that the value of exports from U.K. refineries of petroleum products is now little below that of coal exports. This is a source of income which was virtually non-existent in 1938. Moreover, even if output targets are reached, there will be a 10 million ton gap between supplies and requirements in ten years time.

If a national plan for fuel is to measure up to this situation, it must not only incorporate guidance as to the type and grades for domestic use and for manufacturing industries; it must also play its part in framing a policy for the nationalised industries (coal, gas and electricity, and railways). Production of fuel for the iron and steel industry must also find its place. One difficulty is the familiar one of capital. Some desirable improvements in major industries would need a capital allocation beyond the economic capacity of the nation. Capital allocation according to results to be expected may be required.

Necessary Competition

Maximum encouragement must be given to competitive enterprise and the consumer's freedom of choice, thereby relating desirable economies to the consumer's pocket, subject to prices charged being related to the true costs of supply. In the domestic field, it has to be remembered that many factors affected by the tastes of the particular consumer prevent a scientific assessment of the overall efficiency of competing fuels. Fuel consumption in terms of coal equivalents within the margins of error of the scientific methods used, is to a large degree dependent on the habits of the householder. Government direction is a poor substitute for the consumer's purse.

So far as the electricity peak load problem is concerned, Dr. Taylor is of the opinion that expansion in the use of electricity for domestic purposes over the last ten years has been accompanied by such an improvement in load factor that charges for electricity to the all-important user—industry—have remained relatively stable. This is so in spite of many factors other than coal prices which have tended to increase the charges. Dr. Taylor infers that because of this, much that has been said about the undesirable effects of water heating and space heating may be discounted. Too little attention, however, has been paid to the proper place of electrical heating in public-authority housing estates and to the undesirability of tenants being denied alternative sources of domestic heating and cooking.

Soundly Based Tariffs

Electricity tariff structures have been much criticised recently, but there seems to be abundant evidence that the existing tariffs are based on a wealth of data and on experience accumulated over many years. In practice, domestic electricity charges attempt a compromise between what is practicable and what the electricity authorities accept as desirable. All industrial and medium-sized, commercial premises should be on a m.d. tariff, and the kVA component of this should be calculated on an annual basis.

Inevitably, these are only some electrical facets of a plan which the author traces in considerable detail. For implementing his scheme he suggests capital allocation on a basis of expected returns. Supervision of the pricing policy of coal gas and electricity would also be required. In the practical field, maximum as well as minimum standards for public authority housing for space heating and domestic water heating are required. Similarly, upper limits might be set for factories. Finally, a Fuel Advisory Committee should be at the disposal of the Minister of Fuel and Power, to assist him especially in supervising pricing policy.

Protecting M.V. Overhead Lines against LIGHTNING

By D. F. OAKESHOTT, B.Sc., A.M.I.E.E.

PART TWO

THE first part of this article discussed fault rates on medium voltage o.h. lines giving a relationship between fault rates and keraunic level. Consideration was also given to network design of systems operating at voltages up to 33 kV and, on a general basis, line construction, whilst the protective value of fuses was discussed in particular. Attention is now turned to measures available for minimising lighting troubles on common types of o.h. line in service.

Earth Wires—Steel Towers

Overrunning earth wires are used nearly throughout that portion of the 33 kV system employing steel towers. The purpose of the wire in this case is to intercept the great majority of lightning strokes occurring to the system and thus prevent high voltages occurring on the phase wires. Ideally, it should therefore be so placed with respect to the phase conductors that they all fall within its "protective zone." This means within a region bounded by a surface in which all earth conductors would have the same probability as the earth wire of being struck, and inside which the probability falls off steeply.

There is as yet no generally accepted definition of such a zone though it is usually taken to lie within that portion of the two 45° planes passing through the conductor and intercepting the earth plane. According to the work of Walter, Schwaiger and Ziegler such a zone errs on the optimistic side. Even if this is fully accepted, it would be uneconomic to give complete protection on the basis of the more stringent considerations.

Fig. 7. Illustrated in the heading is the use of 33kV duplex rod gaps on a transformer bushing

A recent paper[3] deals in some detail with this question. The author uses as a basis results obtained from lightning-stroke measurements carried out over seven years on German systems of 15 to 220 kV, having an overall length of 2,000 km. He states that to avoid strokes on the conductors they should lie within a zone, as defined above, but with a vertical half-angle of 34°. This implies that at least two earth wires are required on flat-configuration lines, though it should be possible to make do with one where the triangular configuration of single or double circuits is employed.

Assuming that all direct strokes to phase wires are avoided by adequate shielding the number of back-flashovers on the line is determined entirely by the lightning frequency, the tower footing resistance and inductance (the latter particularly when the resistance is less than 10 ohms or so), span length, line configuration, and the surge-strength of the line insulators. The influence of these factors on the performance of lines is discussed in some detail by Lewis[4] and others.

The actual calculation of the fault rate from a knowledge of these parameters is, however, exceedingly cumbersome by analytical methods. Harder and Clayton[5] provide tables for this purpose, based on recurrent-surge oscillograph measurements on artificial lines. Their tables give 1 and 3·25 flashovers/100 miles/year when applied to the British

132 kV and 33 kV systems of steel-tower construction respectively.

Of these rates of flashover, the authors estimate that only some 50% cause outages whereas in fact 1 and 3·8 outages/year, respectively, are recorded,[1] and thus agreement between their tables and experience is but moderate. It should be borne in mind that they assume a linear relation between fault-rate and keraunic level (whereas there is some evidence, as discussed earlier, that the variation is more rapid) and they base their tables on a keraunic level of 30. Nevertheless, as emphasised by the authors, the tables are useful for comparing the performance of lines of various designs.

Fig. 8. Here are seen duplex rod gaps on an 11kV stonework tank distribution transformer (British Power Transformers Ltd.)

These considerations apply without qualification most particularly to the medium and high voltage systems with solid earthing. They are, of course, directly applicable to a portion of the 33 kV system and also to some extent to a small amount of the 11 kV system although here, and even at 33 kV, induced voltages due to nearby strokes may cause flashover.

It should perhaps be mentioned that considerable potentials are produced on the phase wire by capacitive coupling with the earth wire when the latter is raised to a high potential during discharge of a stroke. The ratio of voltage on the phase conductor to that on the earth wire is known as the coupling factor C and this factor may, for typical spacings, have values of the order of 0·2 to 0·5. It will be observed that the coupling has mainly a favourable effect in reducing the voltage across the line insulation and thus reducing the number of flashovers.

Wood-Poles

The voltage induced by a nearby stroke has been shown to have little effect in practice on very high voltage lines.[6, 7] This is far from being the case, however, with lines of lower voltages. In particular, those with wooden poles and an underrunning earth wire, or of all-insulated construction, or those with no earth wire but earthed at every tower or pole, are liable to give trouble.

The potential induced on a line of height h, in a uniform field E, when that field suddenly collapses is, on the simplest assumptions, Eh. Typical values for E and h are 50 kV/ft and 30 ft respectively so it may be seen that considerable potentials may be built up, even allowing for the fact that the full value Eh is never obtained since the field-collapse takes place in finite time and for other reasons.

The presence of an earth wire adjacent to the conductors distorts the field, reducing

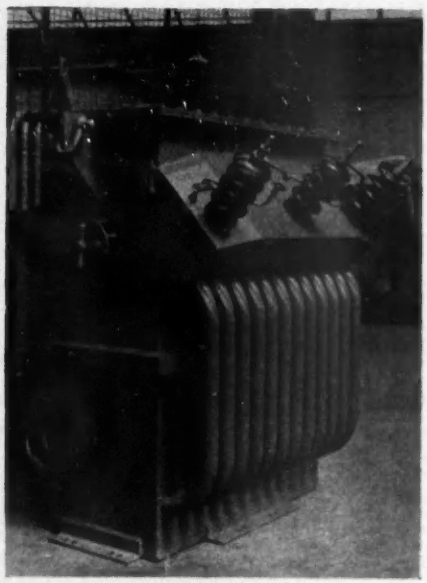


Fig. 9. Another example of the use of duplex gaps seen here on the 11kV bushings of a steel tank transformer (Transformers (Watford) Ltd.)

their effective height. It also increases the capacitance to earth of the phase conductors, particularly if the field from thunderclouds is so high that there is corona on the earth wire and conductors, since their diameters are effectively increased under these conditions. This effect tends to reduce the voltage appearing on the line when the bound charge is released by the field collapse.

The "protective ratio" of an earth wire is defined as the ratio of the potential with earth wires to that without them. Values for various typical conductor arrangements, all with overrunning earth wires, vary between approximately $\frac{1}{4}$ and $\frac{1}{2}$.[8] Values nearer unity would of course apply in the case of lines with underrunning earth wires.

On B.S.1320 type lines there is no earth wire, earthing of any sort being confined to the poles on which transformers are mounted. In this case there is, of course, no relief from the full effects of induced potentials and the onus is on devices such as the rod gap or arrester for protection. The popularity of this construction is thus based on its simplicity, cheapness and relative freedom from bird trouble and from conductor clashing.

On many wood-pole lines with unearthed pole tops, such as those to B.S. 1320, a stay is necessary on angle towers. This must be of insulated construction. Woods of various types have been used for the "stay insulator" —inserted in the wire near the pole-top. Of recent years a substitute in resin-bonded wood laminate has also been employed. Since this insertion will be in length only a small fraction of the tower height, it will be, in most cases, the limiting insulation to earth on the tower where surges are concerned.

Tower Footing Resistance

The overrunning earth wire is clearly only effective if the footing resistance of the towers is sufficiently low. The voltage RI, appearing on the earth wire (where R is the tower footing resistance and I the stroke current) will too readily cause flashover of the insulation if R is high. Owing to the coupling factor, mentioned earlier, the line insulation is actually subjected only to 0·8RI-0·5RI, but this does not affect the issue here. Flashovers of this type are known as back-flashovers; they can of course occur at a tower, over the insulators, or at midspan.

There is, however, a lower limit beyond which little is to be gained by further reduction in resistance. This limit is of the order of 10 ohms[9] and is a consequence of the finite inductance of the tower which permits

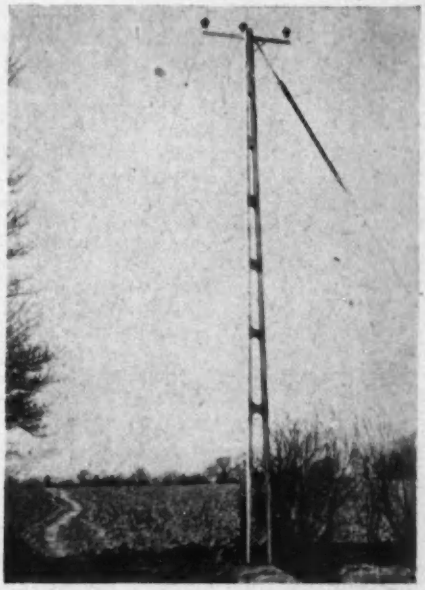


Fig. 10. Typical concrete angle pole on an 11kV line, showing arc-gap across stay insulator

a voltage comparable with that due to the resistive component to appear during the wave-front. In this country it is relatively infrequently necessary to take special steps to lower the footing resistance of steel towers, the naturally occurring values being in general acceptable. Where, however, several consecutive towers with high resistance footings occur in a line, additional earthing should be employed.

On wood-pole lines with earth wires, any metal work, such as the crossarms, is joined to the earth wire and connections are made to earth approximately four times/mile of line. On lines without earth wire, all metal work is earthed at each tower. The earth electrodes in either case are rods or plates.

Probably the most economic form of earth electrode for this application is the system of copper rods 8 to 12 ft long driven into the soil. Having a distance between each rod at least equal to its length achieves reasonably effective "paralleling" of the individual rod's earth resistance.

The resistance of a rod in soil of uniform resistivity, ρ, is given approximately by the expression:

$$R = \frac{\rho}{2\pi l} \log_e \frac{4l}{d}$$

where l is the length, and d the diameter, of the rod.

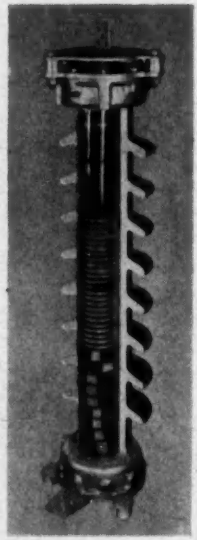


Fig. 11. Sectioned "Metrosil" arrester for 33kV (Metrovick)

From inspection it will be seen that the resistance changes only slowly with diameter. For example, for a 12 ft by $\frac{1}{4}$ in. rod, doubling the diameter decreases the resistance by only 10%. On the other hand, the change with length follows very nearly a simple inverse law. As great a length as convenience permits should be employed, bearing in mind that soil rarely has uniform resistivity. Advantage should be taken also of any relatively low-resistance strata existing reasonably near the surface in order to achieve as low a resistance as possible economically.

The resistance of an earth electrode will rise enormously after the passage of fault current if too high a current density is allowed to occur in the immediately adjacent soil. This was shown in field tests carried out by the B.E. Laboratories in 1950. It was concluded that for a sustained fault the current in a $\frac{1}{4}$ in. by 12 ft rod should not exceed 150 amps in soil of 5,000 ohm-cm resistivity. This figure would probably have to be reduced somewhat in soils of very much higher resistivity owing to the higher local potential gradients and heating, with the consequent tendency to arc and dry out.

The earth plate of comparable resistance to a rod system has a higher current capacity. For example, a 4 sq ft plate is roughly equivalent to two of the above rods in resistance but will take nearly 1,000 amps compared with 300 for the rods. Moreover, its higher electrostatic capacity will tend to reduce the initial impedance for steep-fronted lightning surges. This does not necessarily mean it is a more economical proposition as it has a relatively high installation cost.

Whatever measures are adopted to prevent direct strokes from reaching the conductors back-flashover can still take place for strokes of sufficiently high amplitude. Travelling voltage surges of considerable magnitude will therefore be impressed on the conductors. In the case of the majority of lower voltage lines, induced surges are also important, and moreover no measures are adopted to screen the conductors in any way. The BS.1320 type lines, for example, of which a great length exists do not even employ an earth wire, so high voltages can readily appear on the conductors.

Spark Gaps

When surges arrive at transformers or other substation equipment, abnormal stresses are, of course, applied and failure would occur in the absence of some protective devices. One of the most common of these is the spark-gap, or "co-ordinating gap" which consists of an air-gap between two rods mounted near the transformer—in most cases, right on the transformer bushing.

This practice is, incidentally, only applicable to the lower voltage systems. It is not in general permissible at 132 kV and above, owing to the danger of damage to the bushing with the higher energy involved.

One side of the gap is connected to earth, the other to the phase conductor. Spacing is such that normally the gap is, of course, inoperative but when transient voltages of sufficient amplitude appear across it breakdown occurs, thus reducing the line voltage to a low value.

Fig. 12. "Metrosil" surge diverters in service on an 11kV line (No. 7 Sub-Area, N.W. Electricity Board)

The chief merits of this device are its simplicity, reliability and cheapness. Its demerits are, (1) operation almost invariably causes tripping of the line (not necessarily involving any loss of supply) since the follow-current constitutes an earth fault; (2) the protected insulation is subjected to a "chopped" or steep-backed wave with each operation, producing high electrical stresses in transformer windings; and (3) there is a relatively long time-lag in its operation after the appearance of surges having amplitudes ranging from the minimum breakdown voltage to some 20% or so above it. In marginal cases this might permit breakdown of insulation which would be protected if only short lags occurred.

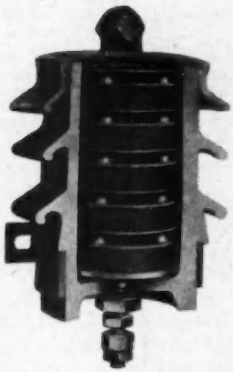


Fig. 13. Shown here is a G.E.C. surge diverter available from 22 to 66kV

Use of the gap at voltages under discussion differs from that at higher voltages. Owing to the order of spacing required for correct operation (approximately 8 in. at 33 kV for example), it is possible for a bird to bridge the gap and cause unnecessary operation. This difficulty is effectively overcome by employing the duplex gap consisting of two gaps in series (Figs. 7, 8, 9). The combined length of the two gaps should be nearly the same as that of the single gap it replaces.

At 33 kV two 3 to 3½ in. gaps in series are frequently used, and at 11 kV, two 1 to 1½ in. gaps, though considerable variations on these spacings may occur in practice for various reasons. The single-gap spacings used on those 11, 22 and 33 kV lines originally part of the Grid were 5, 7 and 9 in. respectively. These values are derived from the expression $(0{\cdot}18E+3)$ in. where E kV is the voltage between phases.

Rod-gaps are very often used as a form of "back-up" protection in conjunction with arresters, so that the apparatus is not unprotected if the arrester fails. This practice is correct only if the gaps are opened up considerably (approximately 30% on Swedish Grid lines for example), otherwise trip-outs can still occur.

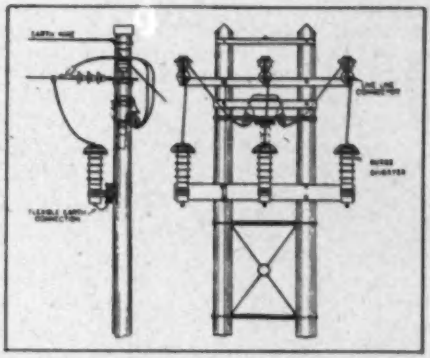


Fig. 14. A method of mounting G.E.C. arresters on an 11 kV, H-type terminal pole

Lightning arresters are extensively used on the lower-voltage systems in contrast to the 132 kV Grid where lightning fault rates and damage to apparatus caused by lightning are low enough to render their use uneconomic except in special cases. Their main function is the protection of transformers although if installed at a substation the switchgear will also be afforded some degree of protection. On most 33 kV systems it is practice to install arresters at nearly all substations where the line is not terminated with an appreciable length—half a mile or so—of cable. At 22, 11 and 6·6 kV the arrester is most frequently installed at the pole top in conjunction with a pole-mounted transformer (Figs. 12 and 14).

Merits of Arresters

Although arresters are of course more expensive than rod-gaps, their operation does not cause tripping of the line. Chopping of the wave, moreover, is not so severe and long time-lags occur over a more restricted range. It is sometimes stated that the controlled uniform field in the arrester gap gives it a surge characteristic similar to that of a sphere-gap, with which long time-lags do not occur. This is not always so however, and lags of over 10 μs have been observed on production models over a voltage ranging from minimum sparkover up to some 5% above it. However, time-lag in operation is not harmful in itself so long as the protective level is sufficiently below the insulation strength of the apparatus to be protected. In the case of the arrester, this latter requirement should not be difficult to achieve.

Under humid and polluted conditions the voltage distribution across exposed insulation tends to become uneven between one part of the surface and another, in particular, between

one unit and another where several are used in series. With normal line insulation this gives rise to discharges and even flashover. With multi-unit arresters the dangerous situation can arise in which one of the units has more than its rated voltage across it. Even the sparkover voltage may be exceeded. When these conditions occur the arrester is likely to be destroyed.

Various measures are adopted to avoid this, chief of which is the use of resistance shunting of the gaps which gives adequate voltage-control particularly when non-linear resistors are employed. Semi-conducting glaze porcelain has also been used on higher voltage arresters.

With single-unit arresters this problem does not arise in so acute a form. Pronounced maldistribution of potential has to occur on the exterior before the internal gap voltage distribution is disturbed to the point of sparkover. All 11 kV arresters, most 22 kV and many 33 kV arresters are of this construction. Above the latter voltage the length of the resistor stack and gaps is so great that it would not be practicable to employ a single porcelain for a container, multi-unit construction being invariably adopted.

It is of obvious importance to know what service is being obtained from protective devices—how often they are called upon to operate and how successful the protection. The rod-gap signals its operation by tripping the line and no difficulty should be experienced in gaining the necessary information from normal fault report procedure. The arrester, on the other hand, should do its job in a less overt way and it is necessary to have some form of counter in the earth connection for this purpose. A counter should really be regarded almost as an integral part of the equipment.

During discharge there may be, in addition to the residual voltage of the arrester, an appreciable potential developed between its earthy end and true earth, depending on the magnitude of the current. It is clear, but none the less worthwhile stressing, that this additional potential should not be applied to the protected apparatus. In other words a good bonding, as short as possible, should be made between the earth terminals of arrester and apparatus and only one earth down-lead employed from the junction. It is still not uncommon to see two separate earth leads with no bonding of this sort in arrester installations. The question of lightning arrester ratings is discussed later in the section on Insulation Co-ordination.

Expulsion tubes are used to some extent at 33 kV. They consist of an external 2 in. gap in series with a 1 in. gap enclosed in a fibre tube covered with a porcelain weather shield. The tube is mounted vertically, the top end is sealed and the bottom end is corked. When sparkover occurs the pressure generated by the arc suppresses the follow-current (somewhat sluggishly, compared with an arrester) and tripping is thus avoided. The operation of the tube is indicated by the absence of the cork.

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(*to be continued*)

European Coal Prospects

IT seems likely that Europe's overall coal deficit in 1953 will be 11·9 to 12·9 m tons; in 1954 there may be no deficit that cannot be covered by drawing on stocks at pitheads. This is the tentative conclusion of the Coal Committee of the Organisation for European Economic Co-operation, as expressed in a report issued last week. The balance that is envisaged is somewhat precarious. It depends on such circumstances as the achievement of production aims (488·3 m tons in 1954) and the gradual return to a steady level of industrial activity as related to consumption figures, as well as normal weather conditions.

Key problems to be overcome are increased production in the U.K. and in Western Germany, to offset the effects of a longer holiday and a shorter working week respectively; disposal of excessive stocks of bituminous and low-grade coal held by some distributors; and organisation of a supply of grades such as coking coal and anthracite which are still in embarrassingly short supply.

United Kingdom authorities felt unable to give the O.E.E.C. secretariat reliable production estimates for 1953 and 1954. The secretariat itself has therefore made an estimate for the purpose of its survey. It places the 1953 deliveries of coal and patent fuel at 212·9 m tons, and the 1954 total at 215·4 m tons compared with 210·4 m tons in 1952.

Our readers' views . . .

Tariffs and Economics

YOU recently drew attention to renewed anti-electric polemics by so-called economists both inside and outside the House of Commons. Their theme is that electricity is too cheap with consequent wastage of national resources; and their remedy is to apply restrictions.

Such remedies cannot fail to have the opposite effect to that intended. Within the electricity industry, efficiency and best use of resources both human and material is ultimately a matter of reducing cost in terms of units sold. It was by exploiting this fact to the limit that the Hydro-Electric Power Commission of Ontario gained such spectacular success. Report after report bears testimony to the vital part promotional tariffs play in this increase in efficiency. In fact, tariffs comprise the tail which wags the supply industry. This was put succinctly by the past Chairman of the Tennessee Valley Authority, Mr. David Lilienthal, when he said in allusion to the vitality of the TVA power programme: "One principle of pricing (for power) must be clearly recognised or the entire significance of the TVA electricity programme is obscured: the tariff charged for electricity, within wide limits determining the cost. No analysis of tariffs for domestic electricity is worth serious consideration unless it is based on this principle."

Much the same thing was said by Mr. Leland Olds, the well-known economist: " . . . you must first reduce your prices to levels which will enable consumers to absorb greatly expanded production and the resulting expansion in demand will mean lower costs."

To anyone who imagines that the electricity systems referred to have special economic tendencies by virtue of hydro-generation the latest TVA annual report will be illuminating. "The increasing dependency upon fuel plant," it says, "is changing the cost characteristic of the TVA generating system." Yet, in spite of this, and of the inflation which U.S. has experienced, the same report can say: "Increased sales more than offset the higher operating expenses resulting from increasing payrolls and higher material costs."

Much real harm has and can be done by failure to recognise the repercussions which tariffs have on all the expenses entailed in distributing a unit of electricity. The effect is not limited to the operation of the undertakings. If Mr. Nabarro and his friends had their way a pretty hefty brick would be dropped into the stream of human endeavour and neither they nor anyone else could foresee how far the ripples would spread and upon whose doorstep they would lap.

The argument they resurrect is not new. In a modified form and for another purpose it was raised in the U.S. well over a decade ago and moreover answered effectively by Mr. L. S. Lyon, who was chairman of the famous Brookings Institution. "The resources of the nation," he said, "should be used so as to give the greatest possible output at any given time for the smallest possible input. This really means that the buyer should be in a position to purchase, at any time, at as low a price as anyone will offer at that time. No one has ever presented a plan so well calculated to make the resources of a nation at all times give the largest total yield to all the people as this."

C. F. Matthews
B.Sc., A.M.I.E.E.
NEWBURY

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Cable Corrosion

I WISH to refer to an article which appeared in your issue of November 5th under the name of Mr. E. P. G. Thornton in which details were given of the construction and performance of protective coverings for cables.

Part of Mr. Thornton's article consisted of informative and mainly accurate data relating to various coverings used by his own and other cable companies and with this I have no fault to find. When he comes to discuss methods of test and test results, however, I feel bound to call attention to what can only be described as the very misleading nature of his conclusions, particularly with reference to the alleged unreliability of coverings employing p.v.c. tapes.

My objections do not so much concern the figures themselves, which as representing the findings of a few tests in a single laboratory are no doubt genuine enough. Unfortunately

they are not presented in that light, but are quoted in such a way as to convey the impression as being fully representative of the kind of behaviour likely to be associated with all such coverings. It is further significant that the few samples using p.v.c. were furnished with only half the thickness of that material recommended by the manufacturers who normally supply these coverings.

In view of the interest evident in several quarters at the present time in the efficiency of various forms of protection, it is to say the least regrettable that Mr. Thornton should have neglected other sources of information if he had in fact intended his survey to be impartial. There is, of course, nothing novel in his suggested modification to test conditions. This has been a fruitful topic of discussion between cable engineers for years past. Likewise he should be very well aware by reason of the considerable volume of information known to most cable manufacturers, that there are many series of test results available using the conditions he cites which entirely reverse his particular findings and transfer all the failures to rubber sandwich samples and all the successes to p.v.c. tapes.

A list of failures under laboratory test of certain types of rubber sandwich coverings could be compiled far exceeding in number those encountered with p.v.c. but no one has so far regarded such evidence as sufficient justification for rushing into print to condemn out of hand the former construction.

So much depends upon choice of materials and manufacturing methods and if Mr. Thornton had been really interested in using efficient coverings with p.v.c. tapes the necessary information was at his disposal.

The resulting article would have gained much in value and would have painted a picture totally different from that presented by the rather one-sided contribution under discussion.

P. M. Hollingsworth

JOHNSON & PHILLIPS LTD.
CHARLTON

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I NOTE in Mr. E. P. G. Thornton's article entitled "Corrosion Protection of Cables" a reference to the limitations of extrusion facilities for the application of p.v.c. or rubber sheathing to power cables, and presume he is referring to his own "local" experience.

As the impression he leaves on this point may be misunderstood, I would mention that my Company have indeed applied p.v.c. sheathings to over 120 miles of power cable without any serious difficulties being encountered, these cables ranging between 0·5 in. and 3·0 in. overall diameter; one assumes that a cable of 3·0 in. overall diameter may be regarded as fairly large in the range of power cables.

I would also mention that polythene sheathing has been applied as a corrosion protection to many miles of telephone cable including cables up to 3·5 in. overall diameter.

F. W. H. Shaw

CHIEF CABLE ENGINEER
SIEMENS BROS., WOOLWICH

Research on Tracking

IN our issue of last week we published a résumé of a report dealing with recent work by the E.R.A. in its investigations into the mechanism of tracking, where variables in the test for susceptibility to tracking were studied. Parallel work is also being conducted on the thermal decomposition of organic insulating materials, and a further report (Ref. L/T274) describes experiments with individual materials.

Broadly, such materials may be divided into two classes in the behaviour on heating. In the first group, nearly all primary degradation products are volatile, in the second, considerable quantities of non-volatile residues (Chors) remain. It is not, however, possible at present to deduce precisely from a given material's chemical composition its tendency to form a charred residue. As it is this tendency which plays a major part in determining that substance's susceptibility to tracking, all investigation into susceptibility must consider each insulant individually.

The report collects such relevant data on the effect of heat on particular polymeric materials as exists and also given results of experiments to determine electrical conductivity of charred residues. Consideration of this data shows that whilst initial chemical reactions at low degrees of heating exhibit wide diversity, reactions tend towards a common result at 500° C. Moreover, the report suggests that some degree of correlation exists between tracking susceptibility and thermal behaviour at this temperature by virtue of the close relation between the former and the proportion of carbon left in non-volatile form after heating.

High Altitude Brush Wear

Special Treatment can extend life on Aircraft Generators

CARBON brushes are usually accepted as current collectors without second thoughts. In the normal course of events they wear slowly due to a combination of mechanical and electrical causes, and need only occasional replacement. However, when aircraft generators incorporating slip-rings are operated at 30,000 ft and higher, there is a sudden change, and wear rises to between 0·01 and 0·02 in./min as against 0·0001 to 0.001/hour normally. This phenomenon, its cause and its cure provided the subject-matter for a meeting of the I.E.E. Utilisation Section last Thursday, when Mr. R. F. Sims, B.SC.(ENG.), A.M.I.C.E., A.M.I.E.E. (Royal Aircraft Establishment) read his paper "The Wear of Carbon Brushes at High Altitudes."

After high altitude wear, the rubbing surface of the brush is rough and disoriented, and the surface of the commutator appears to be raw copper slightly greyed by a deposit of graphite. Besides the brush, the commutator or slip-ring is also worn rapidly, and this wear appears to be entirely independent of the current flowing across the contact surface.

The classical explanation of graphite, i.e., carbon brush material, as a substance of inherently low friction is that given by Sir William Bragg. This sees graphite as composed of hexagonal crystallites, with a spacing between the crystallites or laminae of about 2½ times that between atoms in the crystallite. The crystallites themselves are as hard as, or harder than, diamond, but the forces holding them together are weak—the lubricating properties, it is assumed, are due to the ease with which the crystallites slide relative to one another. Now, however, it appears that atmospheric conditions are an essential factor in the process.

In normal atmospheric conditions at sea level, there is an adsorbed film of carbon on the rubbed metal surface, so that rubbing takes place between carbon and carbon. At high altitudes this adsorbed film is absent.

Various investigators have determined that at normal temperatures there is a critical water-vapour pressure of about 3 mm mercury below which rapid wear occurs, but above which it does not. For oxygen, in the absence of water vapour, the limit is about 300 mm mercury.

The effect of water vapour is practically instantaneous, and is reversible. It is also effective when all other gases are practically absent. One investigator has expressed doubts as to water having any direct lubricating effect, his explanation being that its true role is that of a catalyst promoting the oxidation of the copper by atmospheric oxygen. While there seems little doubt that water in sufficient quantity does inhibit wear in the absence of oxygen or metallic oxides, experiments also suggest that chemical action on the copper may be an important factor in the inhibition of high altitude wear.

R.A.E. Experiments

To investigate the behaviour of brushes at high altitudes, the Royal Aircraft Establishment has constructed an apparatus consisting essentially of three sealed chambers containing slip-rings. The slip-rings are driven by external motors, and air which has been dried to the desired frost point is drawn through each chamber by means of a vacuum pump.

Results obtained with this apparatus show that at a given altitude the rate of wear falls rapidly as the partial pressure of water vapour rises, eventually becoming negligible at a fairly sharply defined pressure. Wear also increases with altitude. If under given conditions the altitude is reduced, there comes a point where the rapid wear stops quite suddenly. The transition can be easily recognised by a sudden change in the voltage drop characteristic. If the brush has been running for some time below this critical altitude, and the altitude then increases, rapid wear will not occur immediately, but at some higher value. It is also found that the critical altitude varies considerably with temperature.

Brush Treatment

To improve brush performance, resort is made to various "adjuvants" (literally, helpers). The most successful have been metallic halides, e.g. barium fluoride. Some authorities consider them to act as catalysts promoting the oxidation of the copper surface, while others hold that they act like water, and "saturate" the cohesive forces which tend to cause perfectly clean surfaces to cling together.

If adjuvant brushes are applied to a clean commutator and immediately exposed to high altitude conditions they will behave no better than untreated brushes. Several hours prior running at high temperature with high atmospheric pressure and humidity are necessary to obtain the best result. The protection conferred by this low-altitude running appears to be due to the development of a film on the commutator surface. Sparking at an altitude in excess of the critical value may destroy the film and allow rapid wear to take place.

The use of adjuvant brushes has practical disadvantages too. To permit the necessary temperature treatment, perhaps at 170° C, the commutator risers must be hard soldered to the armature conductors. Further, adjuvant brushes have higher electrical losses and friction. They are also liable to give uneven distribution of current over the brush surface. From these reasons, treated brushes should not be used unless they are absolutely necessary, and the machine should be designed with the brushes in mind.

If brushes are used, conditions must be made as easy as possible for them. To avoid sparking there must be full use of armature compensation and interpoles, and correct proportioning of the magnetic circuit to avoid the necessity for critical brush setting. This will mean rigid and accurate commutators and stable brush box design. In the words of the author: it is better to have a generator weighing 100 lb which continues to work at 50,000 ft, than one which weighs 75 lb and fails at 30,000 ft.

DISCUSSION

R. H. Woodall (Rotax) said that trouble had been experienced with brushes on propeller-turbine aircraft, and asked if vibration might play a part in breaking down brushes. He felt in any case, that the future of d.c. generation in aircraft was uncertain: the constant frequency generator and the induction motor might better serve the needs of the industry in the future.

B. J. Elkins (British European Airways) said that at one time brushes were wearing on the Dakota airliner faster than the brush manufacturers could supply replacements. The brushes took 40 hours to bed and wore out in 30 hours! Now, however, brushes were available with a probable life of 1,000+ hours. In certain cases new brushes could be taken without bedding, etc., and put straight on to aircraft. It had to be realised, however, that these aircraft did not fly at heights greater than 27,000 ft.

J. G. Carr (R.A.E. Farnborough) showed photomicrographs illustrating the condition of brush and commutator surfaces during rapid wear. Effectively, very small fragments of copper were dragged from the commutator and then pulled in a work-hardened state across the commutator, abrading the brush surface.

M. Vaughan (Morgan Crucible) thought that neither of the theories of adjuvant action mentioned in the paper were wholly satisfactory. He thought it unlikely that barium fluoride would enter into any chemical reaction. He did agree with the author's remarks about the importance of designing generators for the use of adjuvant brushes. In some cases generators have had to be derated to permit such brushes to be used.

J. F. Lewis (Ministry of Supply) took up this last point, emphasising that in many cases such generators were designed before adjuvant brushes were available. He thought that vibration was a contributory cause of brush wear.

I. A. Mossop (R.A.E. Farnborough) said that in recent years methods had been suggested for raising the partial pressure of oxygen and so keeping down brush wear. He also asked for more information about the nature of the commutator film formed when adjuvant brushes are used, and whether vacuum coating methods might be used to deposit a suitable film.

B. R. Atkins (Nobrac Carbon Co.) described an approach his company was making to the problem by getting away from forming films. They were working on a type of brush which has a skeletal form which acts as an auxiliary bearing compound and is not affected in the same way as carbon. Vacuum chamber tests up to 80,000 ft had proved promising.

W/C H. J. Irens (Air Ministry), said that he had experienced very little trouble with generators, but much more with invertors. The Canberras in the recent air race had no brush trouble. With regard to barium fluoride brushes, the 100-hr bedding time was unacceptable in service practice. More electrical motors would be required in service aircraft in the future when powered flying controls came into wide use.

Various other speakers asked questions, and the Author replied at some length. He said that vacuum bell tests had failed to confirm that vibration had an effect on rapid brush wear. He noted in respect to tests in general that some objective test for sparkless commutation was needed, and felt that a radio interference test might be capable of development.

With regard to the effect of the presence of water and the comparable effect of barium fluoride adjuvant, he personally thought there was little doubt that water merely acted as a physically adsorped film, in effect providing extreme pressure lubrication on the face of the graphite. Unfortunately, in the case of barium fluoride the action was by no means as clear, and attempts to establish the nature of the film formed by such techniques as X-ray diffraction had proved unrewarding.

When trouble with invertors occurred, as mentioned by W/C Irens, the trouble was probably due not so much to commutator design as to machine design, there being an absence of suitable compensation and, possibly, unsatisfactory brush gear.

From AN ENGINEER'S NOTEBOOK

WHY is it, I wonder, that automatic devices have such an appeal for all of us? Does it stem from boyhood experience with clockwork trains, or is it something more innate, something which symbolises man's ceaseless struggle to triumph over nature by fashioning robots in his image? While I am certain there is some such fundamental factor in our make-up, it would be better to leave the subject to psychologists and return to the experiments of Dr. Zworykin which set off this train of thought. With the object of reducing the number of road accidents, he has developed a method for automatically steering a car along a prescribed route, of stopping on approaching an obstruction, and of turning into a second lane to overtake a slower moving car. The method is proposed for modern highways with double lanes and clover-leaf crossings, where structural conditions permit of the laying of control cables in the surface of the road. These cables would carry currents to be detected by two coils on the car arranged to correct any deviation from the line of the cable. The cable would also be used to carry warning signals from any car or other obstruction ahead which would lead to the braking of the car, or to its deflection via a diagonal wire on to the cable along the second traffic lane. Interesting as this proposal may be, it obviously lies a long way in the future. The first need, in this country at least, is for the type of highway that is postulated, and as such a road is not the one on which the greatest number of accidents occur, I find it very difficult to find justification for the idea, in spite of its ingenuity and its undoubted superficial attraction. But be this as it may, it must have been great fun working out the models.

• • •

NOW I must turn to a more scientific subject; one that has interested me greatly, although I confess it is one of some complexity. Surprisingly, it has been found that certain paramagnetic igneous rocks possess a magnetism reversed in polarity to that which would be expected, bearing in mind the earth's field. Additional evidence has recently become available supporting Néel's theory that the self-reversal arises from the presence of two kinds of particles of different Curie points. When a material cools from above the Curie temperature where it exhibits no magnetic properties, it passes through a phase where it is susceptible to magnetic fields, following changes in field strengths instantaneously. Then at a temperature lower than the Curie point, called the blocking temperature, the existing field within the material becomes as it were, fixed, and as the temperature continues to fall the thermo-remanent magnetism builds up to its final value. With such physical changes on cooling, it is possible to explain the reversal of magnetism in terms of closely interspersed grains of two materials, one having a Curie point below the blocking point of the other. It appears to act something like this: as the first particles, A, cool to below the Curie point, they become susceptible to the earth's field, and on falling further to below the blocking point would build up thermo-remanent magnetism to a value possibly greater than that of the earth's field. As the mass continues to cool and passes below the Curie point of particles, B, these in turn would become susceptible to the prevailing magnetic fields which now consist not only of the earth's field but of that due to the A particles also. Consideration will show that the latter field will be in opposition to that of the earth, and if it is of greater intensity, it will be the predominant field when the B particles cool below their own blocking temperature. Finally, if the value of thermo-remanent magnetism in the B particles is greater than that of the A, then the external field will show the reversal which is in fact experienced. If readers have been patient enough to follow me thus far, they will see that for such a theory to work requires a nice balancing of physical factors, with as many coincidences as the average thriller. Nevertheless, a study of the physical properties of the components of rocks, from specific localities which exhibit magnetic reversal, supports this rather complex theory. Unfortunately, wider investigation on rocks from other sources also exhibiting magnetic reversal suggest some other physical mechanism may be at work. In these mixtures of materials of different Curie points, it would seem that there are endless permutations of what can happen on solidification of the mass.—*E.R.G.*

TESTING A.C. INSTRUMENTS

I.E.E. Measurements Section discuss Present Day Practice at N.P.L.

PROBLEMS associated with the testing of alternating current instruments at the N.P.L. were discussed last week at the Measurements Section of the I.E.E. Presented by Dr. A. H. M. Arnold, PH.D., D.ENG., A.M.I.E.E., the paper under consideration ranged over the whole gamut of precision instrument testing, highlighting the three particular problems of transfer instruments, resistance standards and supply stability.

Instruments are tested at voltages up to 100 kV, and currents up to 20 kA, and at frequencies from 20 c/s to 100 kc/s, although these limits do not apply simultaneously. To ensure accurate testing, power supplies (other considerations apart) must therefore give satisfaction in a number of characteristics. The available output must be sufficient to supply all losses in the testing circuit, which, in an extreme case, can attain a value over 30 kW at 66 kV. More commonly, the power requirements are of the order of 100 W. In the latter case, this requirement can be met by an oscillator and amplifier but 30 kW can be supplied satisfactorily only by rotating machinery which introduces the problem of supply stability.

Supply Stability

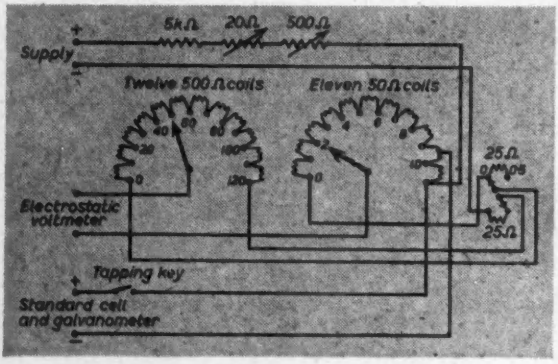
Although power systems used for testing instruments at the N.P.L. are inherently stable (consisting, in the main, of two alternators driven by a d.c. motor energised by lead-acid batteries), the electrical conditions will not be constant with time. Broadly, two types of change occur—long term variations of voltage, current frequency which are seldom of any great importance and short term variations created by sudden changes in circuit impedances. Since the test instrument and the standard rarely have the same speed of response to such changes, this type of variation can prove most troublesome, especially if the interval between disturbances is such that the system will not have recovered from one before the onset of the second.

Contact Resistance Variations

Variations in brush contact resistance in the generator field circuits and in the armature circuit of the driving motor are the most likely cause of disturbances. Four brushes are fitted to each slip ring of the alternator field circuits to minimise variations, and slip ring and commutator surfaces are given careful attention. Moreover, the inductance of the field circuit assists in preventing sudden changes in field current whilst the inertia of the rotor itself plays a part in reducing frequency and output voltage variations caused by motor speed changes. For short periods, generator output voltages can be relied upon to within 0·02%. Larger changes however occur from time to time.

On the other hand, electronic power supplies hold certain advantages from the point of view of stability and, at audio frequencies, they are essential as the waveform of the output from rotating machines designed for these frequencies is not usually good. Such equipment however is limited in power output, the two units at the N.P.L. having 100 and 700 volt amps output respectively.

All a.c. measurements are referred to the national d.c. stan-



This diagram shows the circuit of the new voltage divide, in use at the N.P.L., which employs only 25 main resistance coils

dards of resistance and voltage, using transfer instruments and transfer resistance standards. In the Weston cell is found a commercially available standard of direct voltage, accurate, by comparison with national standards, to one part in 100,000. Due to its temperature co-efficient of e.m.f., its temperature must be kept constant is within 0·25° C if this accuracy is to be approached.

Calibration Problems

For calibrating the a.c./d.c. transfer instruments—electrostatic voltmeters of f.s.d. between 50 and 160 V—the N.P.L. employ the method involving a voltage divider. Although the introduction of resistances into voltage measuring circuits can be disadvantageous, the effect is lessened since only resistance ratios are involved. The divider recently adopted by the N.P.L. provides any voltage from 0·5 to 131·5 V in steps of 0·5 V to an accuracy better than 0·001 V. As the voltmeter itself may not be read to an accuracy greater than 0·002 V, the divider will not introduce a detectable error into the calibration. Moreover, whereas the original divider had 50 resistance coils, the new unit makes use of only 25 main coils, each having an auxiliary coil for adjustment. Main coils are wound with 0·0048 in. dia. "Evanohm"—a nickel-chromium-aluminium wire of temperature co-efficient less than three parts in one million/° C at 20° C. Change of resistance of the whole divider due to self-heating falls below one part in 100,000.

Apart from the electronic voltmeter, the vacuum-junction thermocouple and the dynamometer are other types of instrument most commonly used for a.c./d.c. transfer. None of these is necessarily free from error, but by careful comparison of each indication, a transfer is obtained which is unlikely to contain appreciable error. For the working standard, the electrostatic voltmeter is used. Where a.c. measurements involve quantities other than voltage, transfer resistance standards are an additional requirement. Earlier types were constructed with manganin or copper-nickel conductors but more recently Ni-Cr-Al wire has been used, resulting in lower resistance changes.

For direct measurement of alternating voltage, or for calibrating a.c. voltmeters, electrostatic voltmeters are again used. By suitable choice of any of the six instruments in use, any voltage between 20 and 160 V may be measured to an accuracy of one part in 4,000, although over certain parts of the scale this can be improved to one part in 10,000.

Where current measurement is concerned, accuracy depends primarily on the value of dielectric current. At power and audio frequencies, however, this factor is not usually so important as that of ensuring a low impedance to ensure minimum disturbance of the circuit conditions.

DISCUSSION

DR. H. D. HAWKE (ELLIOTT BROS.) suggested that the accuracy of any standard should be five times greater than the accuracy required of the instrument to be calibrated. He was pleased that stability of supply was at last being tied up with the accuracy of measurement, although in general they would like stability to be several times better than accuracy of measurement. These conditions seldom occurred in practice. The time was overdue when a specification for a precision instrument should contain a clause giving permissible error on a non-sinusoidal wave shape and also a clause limiting the instability of supply on which the instrument could be used and still maintain its guaranteed accuracy.

MR. H. S. PETCH (B.E.A.) emphasised that instruments needed by Area Boards to test consumers' meters had to be of a high order of accuracy. One of the problems lay in the transport of instruments; voltage and resistance standards would travel pretty well but the instrument for a.c./d.c. transfer presented a problem. Speaking purely from the meter testing point of view, where rotating devices were used more and more, he asked whether the instrument moving backwards and forwards between the N.P.L. and the Area Board test rooms could not also be a rotating device, which could be made transport proof.

MR. F. BYRNE (B.E.A.) asked what was the permissible limit of error in relation to the accuracy of the test, if a standard instrument must be more accurate than the test instrument. Was there a generally accepted relationship? The author had suggested a factor of 10 to 1, but could they not have an authoritative lead on the question? There should also be a relation between stabilisation and accuracy, especially for tests on energy meters. Had the author considered the use of the a.c./d.c. comparator? A comparator which would behave satisfactorily on an unstabilised a.c. supply would be an important development, and such an instrument had recently been described, consisting of two dynamometer elements mechanically coupled but free to move in a limited arc.

MR. P. VIGOUREUX (A.M.) asked whether the difficulty with rotating machines was due only to the fact that they had slip rings and brushes. Machines were available—although possibly expensive—which used a fixed winding fed through an auxiliary gap.

PROBLEMS AND PRACTICE in Engineering

Operating Coils

THE rewinding of several 440 V contactor coils to operate at 50 V has recently been undertaken to make intrinsically safe pendant-type control switches where they are employed in situations that make them potentially dangerous at the higher voltage. Small 440/50 V transformers, with the secondaries centre tapped to earth, are used in the main control supply, and the 50 V operating coil windings were derived from the 440 V coil particulars as follows.

440 V coil: resistance R_1, current I_1, wire size a_1, sq in., mean turn mt_1, in.

$$Z_1 = \frac{V_1}{I_1} \quad \cos\varphi = \frac{R_1}{Z_1}$$

50 V coil: $I_2 = \frac{V_1 I_1}{V_2}$ $Z_2 = \frac{V_2}{I_2}$

$R_2 = Z_2 \cos\varphi\, a_2 = \frac{I^2}{I_1} \times a_1$ sq in. (to the nearest suitable wire size).

From wire tables take the resistance/1,000 yards of a_2 and calculate length for R_2, when turns $= \frac{\text{length of wire}}{mt_1}$.

It is often necessary to check the resistance of operating or field coils and a close approximation can be obtained by a calculation from the coil dimensions, which may require the removal of the outer tapes to reveal the actual winding. Measure the coil depth which, divided by the wire dia., gives the number of turns per layer. The total number of turns is now the product of turns per layer and the number of layers, which when multiplied by the mean length of turn gives the total length of wire.

$$R = \rho \frac{l}{a}$$

ρ = resistivity of copper = $0{\cdot}067 \times 10^6$ ohm in. The resistivity can be obtained from the resistance/1,000 yards given in the wire tables, $\rho = \frac{\text{resistance} \times a}{36{,}000}$ ohm in. at 60 F°.—*T. H. Snelson.*

Ceiling Roses

IN reference to the article on a stubborn ceiling rose (8.10.53), whilst the use of a sharp penknife is a good method it does need considerable care, as J.H. stated.

A vastly superior method of freeing a painted ceiling rose, a method with which I have had considerable success, is to immerse a cloth in hot water and then wrap the hot cloth round the ceiling rose. After several applications the ceiling rose will expand, crack the offending paint and can then be unscrewed with ease.—*H. B. Ingram.*

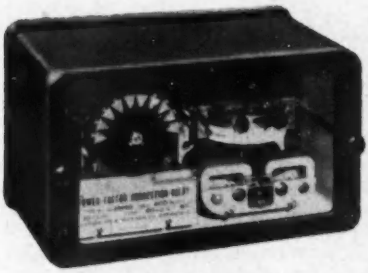
Cable Fault Location—Current Transformer

I NOTE with interest your recent contributor's reference to my article on the above, under the nom-de-plume of "1066."

I should imagine that his remarks about O.C.B.s will arouse comment from the various manufacturers as it is quite a standard practice these days to have the secondary windings of current transformers open circuited when the O.C.B. is isolated from the bus-bars. There is no disadvantage or danger in this as no current can pass through the primary or secondary of C.T. unless when connected for test as in my article of 29-10-53, which was agreed as a bad condition and one to be avoided. Had the C.T.s in this case not been in "Penetrol" I should certainly have removed same from circuit before H.V. testing.—*H. W. R. Ogden.*

Starting Single-Phase Motors

I RECENTLY came across a 230 volt singe-phase inductor-start motor which was used for driving a d.c. generator to provide testing supplies at 24 volts for testing battery-powered wireless equipment. The complaint was that there was a starter fault, as the starter would trip-out on the thermal overload trips several times before the motor could be run up to speed. Upon examination, however, the starter itself appeared O.K. and attention was paid to the motor. It became obvious, upon listening to it when the starter was operated, that it was not developing sufficient torque to overcome the friction of the set and was running on one of the harmonics. As a start could ultimately be effected it was concluded that the warming up of the motor after several attempts was sufficient to reduce the viscosity of the grease in the bearings to a point where sufficient torque could be developed. In consequence the bearings were removed, cleaned and replaced and a lighter grade of lubricant used. This proved an effective cure.—*P. I. G.*



Correcting Power Factor Automatically

SIMPLICITY OF OPERATION AND ROBUSTNESS CHARACTERISE NEW RELAY

THE correction of power factor is in most cases a variable factor dependent on the load. For that reason any automatic system, which will vary the amount of reactive kVA by switching in the necessary static condensers as required is well worth while. One of the latest of these relays has been developed by Chamberlain and Hookham Ltd., of Solar Works, Bartholomew St., Birmingham, and is much smaller and more compact than equipment previously available.

Such relays and their associated equipment are of course most useful where penalties are applied in tariffs for the non-attainment of a minimum power factor.

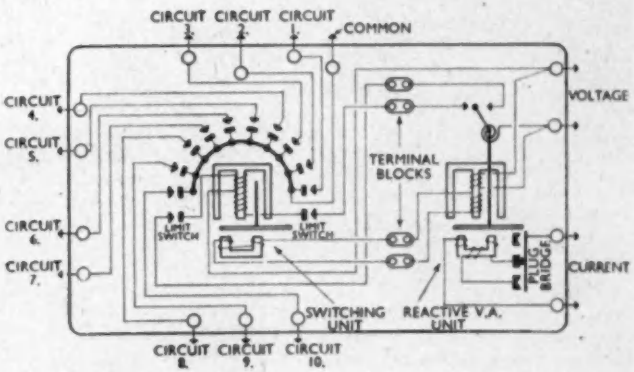
Construction

The type Bpf relay, consists fundamentally of two interdependent parts, the first being an induction pattern mechanism, sensitive to reactive volt-amperes and the second a switching unit driven by a reversible motor. The reactive volt-ampere element operates on the same principle as the induction watt-hour meter and consists essentially of two electromagnets between which a pivoted aluminium disc is free to rotate. The current and voltage coils are connected into the load circuit in such a manner that (assuming balanced load) under unity power factor conditions the voltage applied to the voltage electromagnet is lagging 90° behind the current applied to the current coil. Under these conditions no torque is developed on the disc which remains stationary under the influence of a hairspring. As the load becomes inductive, the current lags, becomes more in phase with the voltage and a torque is developed. With a capacitative load the reverse action occurs. Thus deflection of the disc depends on the sign as well as on the magnitude of the reactive volt-amperes in the load. Disc damping is provided by two permanent magnets.

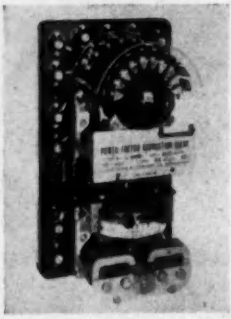
A moving contact is fixed to the disc and moves between two adjustable contacts connected to the voltage winding of a reversible motor in the switching unit. The circuit is so arranged that the direction of rotation of the motor is dependent on which of the contacts is closed.

Contact Operation

The motor is connected *via* a train of gears to a contact-making device which progressively closes or opens a series of circuits depending on the direction of rotation. These contacts can be used for operating external contactor gear which will then switch in, or



The horizontal version of the relay is shown in our heading block. On the right is a circuit diagram which shows the method of operation of the assembly



The vertical version of the relay is illustrated in this view. The large contacts and the ease with which they can be examined is well shown

out, the appropriate condensers. When the power factor has been corrected, the disc automatically moves to a neutral position and cuts off power to the motor.

Plug settings are provided to give 4, 12 and 20% of the nominal full load VA of the relay. The adjustable contacts operated by the disc movement can also be moved and in conjunction with a scale give multipliers which must be applied to the selected plug settings. There are four positions on either side of a central zero, and thus with the plug in, say, the 4% position, contact settings up to 16% in either direction are possible.

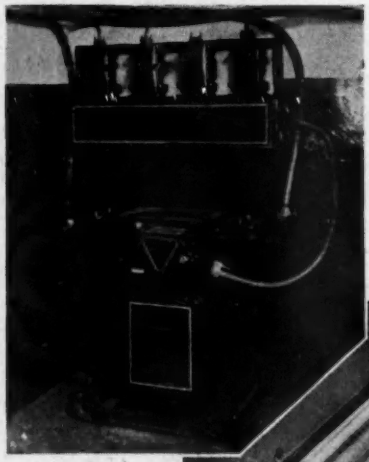
Contacts

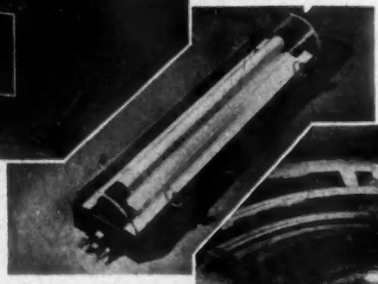
As the unit may be called upon to switch various forms of outside contactors, and as in some cases d.c. operated contactors may be desirable to avoid chatter, the contacts on the switching unit are made with wide gap clearances and are of massive self-cooling construction with high contact-pressure and are thus suitable for all types of installation. The contacts can be readily examined through a glass cover. At each end of the contact bank is a light duty limit switch which prevents overrunning.

The whole equipment is compact and is available in two versions; one with the two elements of the relay mounted horizontally and the other with them mounted vertically. Projecting and flush pattern cases are available both for the horizontal and the vertical lay-outs of the instrument.

Fluorescent Fittings for Pits

Part of recent work by the West Midlands Division of the N.C.B. has been concerned with linking up the two Staffordshire collieries of Mid-Cannock and Cannock and Seacroft, with consequent fuller exploitation of their joint resources. For lighting loco-roadways of the Mid-Cannock pit, 150 non-flameproof fluorescent fittings have been installed by the Colliery's Electrical Department. Of Simplex Electric Co.'s manufacture, the fittings, utilising a 40 W hot cathode tube, are mounted at 24-ft. intervals to give illumination levels varying from three to one lumen/sq.ft. Thirty such units are connected to a single circuit fed from a Simplex distribution board. Although this new non-flameproof fitting has been designed specifically for use in colliery main roadway, the manufacturer states it can have other applications. It can accommodate either 20 or 40W tubes, and has a total weight of some 13 lbs





These illustrations show the quality of lighting along the roadway, the fitting itself, and the distribution gear supplying circuits

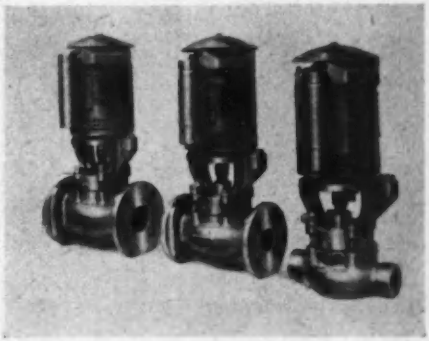
Electrical Engineering at the Building Trades Exhibition

CELEBRATING its Silver Jubilee, this year's Building Trades Exhibition, which opened at Olympia last week, is one of the most representative displays of its kind to be held in this country. Electrical engineering plays its important part in many exhibits, chief among which is the novel display of a heat pump. A joint display of five organisations, including the B.E.A., E.R.A. and S.W. Electricity Board, this stand features the heat pump installation at the Festival Hall, a working model showing how the pump can provide hot water and refrigeration simultaneously at a fraction of the fuel consumption of an immersion heater and refrigerator.

Also in the field with electric heating equipment are Aidas Electric, with a new "Sadia" three gallon thermal storage water heater for domestic use. For space heating, Dimplex display a range of oil-filled electric radiators from ½ to 2 kW, whilst a new introduction is their double-sided detachable towel rails. On E. K. Cole's stand, attention is drawn to new floor standing "Thermovent" convection heaters and "Thermopanel Radiant Glass" heaters providing infra-red radiation within a few minutes of energising. British National Electric's display of cookers provides further indication of the scope of electric heating.

Electrical installation work is represented in many ways, the theme being set by E.D.A. who have a relief model of a ground floor depicting the ring mains circuit, with another feature devoted to 13 A plugs and socket-outlets. The latter is also shown by Edison Swan in their "Windsor" range whilst fluorescent fittings are also displayed. Key Engineering feature uses of their "Key" fibre conduits, of particular note being the duct wiring system in this material for underfloor installation. Newcomers to the exhibition are Philips Electrical, who display examples representing their range of floodlighting fittings for use in facilitating work after dark. For the same purpose, a number of organisations, including Arthur Lyon and Co., the Brush A.B.O.E. group and R. A. Lister, feature generating sets for use on remote sites.

Powered equipment for woodworking, building and other uses includes floor cleaning, scrubbing and scarifying units shown by Cimex-Fraser Tuson, and the Columbus Dixon Organisation. Portable tools are a feature of Wolf Electric Tools, Kango Electric Hammers and many others. For water supply systems, James Beresford exhibit their submersible electric pump.



In the heading illustration is seen a floor cleaner by Cimex-Fraser Tuson, whilst on the right are Beresford hot water accelerator pumps

overseas news

Decentralisation

Decentralisation of the Rural Electrification Department of the Saskatchewan Power Corporation, has been instituted in order to take farm power facilities closer to the people involved, it has been announced by Mr. J. W. Tomlinson, general manager of the Corporation. The province's area of 250,000 square miles has been split into three farm electrification zones—Regina, Yorktown and Saskatoon, each served by its own regional office. Plans for such a move have been progressing for many months. About 18 months ago an experimental plan was set up whereby the head office staff in charge of farm electrification work was divided into groups, each of which was responsible for given zones of the province. The plan worked successfully, but recently it was decided that even greater efficiency would be gained if the groups actually moved into the zones and carried out work in the field.

A Recommendation

The Public Utilities Committee of Winnipeg city council has approved the recommendation of Mr. H. L. Briggs, general manager of the City Hydro undertaking (to which we referred on November 12), that consulting engineers should be instructed to assess the present status of the council's Pointe du Bois hydro-electric plant. The committee has suggested that the firm of H. G. Acres and Co. Ltd., be authorised to ascertain whether (a) the plant should be modernised and new equipment added, or (b) the plant should be completely rebuilt as a long range project for the power needs of the province. The Pointe du Bois plant, on the Winnipeg River, 77 miles north-west of Winnipeg, has a capacity of 105,000 h.p. at present. It is estimated that the maximum output of the plant, with a rebuilding programme, would be approximately 145,000 h.p.

Plant for Nova Scotia

A new 30 MW Metropolitan-Vickers turbo-generator was put into commission at the Water Street plant, Halifax, of the Nova Scotia Light and Power Co. Ltd., a few days ago. This brings the capacity of the station to 73,600 h.p.—about two-thirds of the company's total system generating capacity. At the formal ceremony, Mr. J. C. MacKeen, president, said orders had already been placed for another 30 MW set which should be in operation in 1955. Looking into the more distant future, he revealed that plans were well advanced for an even larger addition which would complete the development of the Water Street site at Halifax.

Chemical Industry's Need

The growing importance of Canada's electro-chemical industry as a consumer of power was the theme of an address given in Montreal recently by Mr. G. K. Dodd, development manager of the Chemicals Department of Canadian Industries Ltd. The electro-chemical industry at present consumed well over 500 million units annually. He estimated that by 1960, if all Canadian requirements were met by domestic production, an additional 500,000,000 kilowatt hours of electric power per year would be consumed. As to the future, Mr. Dodd said that two additional processes may be established in Canada within a reasonable length of time. One involved the production of metallic sodium and chlorine through the electrolysis of fused sodium chloride, which could be used in the manufacture of several chemicals now imported into Canada in substantial quantities. The second process involved the production of chlorine without caustic through the electrolysis of muriatic acid, which would assist in restoring the balance between the demand for chlorine and the market for caustic soda.

Another Ontario H.E. Station

A new hydro-electric station is to be built by the Hydro-Electric Power Commission of Ontario at Manitou Falls on the English River, north-west of Fort William, Mr. R. H. Saunders, chairman of the Commission, has announced. The station will have an installed capacity of 46,200 h.p., and is planned to be in operation in 1956. A 13-mile main transmission line will be erected, and a 14-mile access road built, making the total estimated cost $15,577,000. This station is intended to meet the rapidly expanding power requirements in the north-west section of Ontario. Most of the preliminary surveys have already been carried out.

Edmonton's Extension

A new 30 MW C. A. Parsons turbo-alternator and a 200 klb/hr gas-fired boiler was recently put into operation at the power station of Edmonton, Alberta, city council. This raises the capacity of the station to 90 MW. Construction of a further similar extension has been started at the south end of the plant.

Finance for Expansion

Faced with a large scale development programme, the Swedish State Power Board has asked the Government for an increase of Kr. 200 millions in its allocation for the fiscal year beginning July 1, 1954. This expenditure will be needed for development of the national power grid system,

the construction of a new steam power station on the West Coast and another hydro-electric plant on the Indal River in Central Norrland. The Power Board approved appropriation for the year ended June 30 next was Kr. 350 millions.

New Copper Mine

Finance has now been arranged to allow for development of the Kilembe copper mine, in Uganda, the Uganda Development Corporation has announced. The other parties to the agreement, which will provide the necessary finance to bring the mine into production, are the Colonial Development Corporation and Frobisher Ltd., the Canadian mining concern. The production plan for Kilembe envisages mining at the rate of about 40,000 tons of ore monthly, from which will be produced a copper concentrate and cobalt pyrite concentrate. The cobalt concentrate will be processed at Kilembe, using power from the Owen Falls hydro-electric station of the Uganda Electricity Board. It had been originally planned to erect a transmission line between Jinja, site of the hydro station, and the Ruwenzori mountains to provide a supply for the Kilembe mines, but it was subsequently decided to smelt copper at Jinja instead of at Kilembe. It is hoped that production will start in 1956.

Plant for Bagdad

Installation of the new 88,000 lb/hr Babcock and Wilcox boiler at the power station of the Bagdad Light and Power Co. has now been completed, we understand, and it will shortly be in full operation. Another similar boiler is in course of manufacture, this being the fifth for installation since the war. The station's installed capacity now stands at 41,000 kW, and at the moment there are no outstanding proposals for adding to the generating plant in view of the uncertain future of the undertaking. We reported in July that the Iraq Government had passed a Ministerial Order for the nationalisation of the company, and discussions were opened, but there has been no resumption of these talks. At the recent meeting of the company, Sir Kinahan Cornwallis, the chairman, stated that it had been reported that the Iraq Government would pay to the stockholders the nominal value of their shares plus the amount shown in the capital reserves. But further news on these matters is awaited.

Suggested Economies

The field of transmission and distribution provided the biggest scope for making economies in the development of the electricity supply industry, it was now realised overseas, Mr. C. E. Ranger, general manager of the Sydney County Council, N.S.W. undertaking, has reported to the council following his recent trip abroad. He visited 22 electricity supply undertakings and 32 manufacturers in U.S.A., Canada, the U.K. and the Continent. Great importance was attached to system planning and development in all the utilities visited, he stated. Its significance was more obvious in America, where the organisation of the supply companies was well established. The area boards in England, while attaching equal importance to effective planning for economical development, were hampered by the problems of integrating into one homogeneous whole the organisation of about 400 undertakings taken over by them. Consequently, the ultimate pattern of division of engineering functions in the organisation was not yet as clear as it was in America. Until recently this side of the industry had been somewhat neglected in favour of emphasis on the provision of adequate and efficient generating plant. With the rising cost of capital equipment, supply undertakings in the U.K. and U.S.A. had reconsidered the standards of reliability of supply economically justifiable for various classes of consumers. He gained the impression that equal reliability could be obtained with a simpler distribution layout and more economical use of equipment. The recommendations are to be studied by the Council's engineers.

Heat for a Mountain Hostel

With a constant stream of visitors to New Zealand's Egmont National Park, the question of facilities at the hostels has been under discussion recently. At the North Egmont hostel, for instance, there is 30 h.p. diesel plant which is working well but it is not large enough for central heating of the hostel, and to provide power for cooking. The New Plymouth city electricity department, asked for an estimate for providing a power line to the hostel, suggested that it would cost about £4,000 to erect the line and another £1,000 to clear the bush, for the department considered that, due to the heavy brush, a wider path than that occupied by the road and telephone would have to be cleared. The Egmont National Park Board considered that this figure was rather high and has asked its North Egmont Committee to obtain further details for consideration, including the possibility of installing a larger generating plant.

Expansion in Kowloon

The China Light and Power Co. Ltd. which operates in Kowloon and Hong Kong, recently laid a submarine cable connecting Tsing I Island with its main overhead line. At the moment the company is constructing three outdoor 33 kV substations in the new territories at San Hui, Taipo and Au Tan. These will eventually be connected up with the Kowloon power station. Capacity of this station, by the way, was increased to 67,500 kW last year, and a further 12,000 kW turbo-alternator is on order along with additional boiler plant. Output of the station last year was over 247 million units.

PERSONALITIES IN THE INDUSTRY

Appointed by Johnson and Phillips, Ltd., as assistant manager, Contracts Department, is **Mr. E. F. Ward,** who was previously a senior administrative engineer on the company's contracts staff. He has been with J. and P. for over 30 years, during which time he has been actively concerned with many large electrification schemes both at home and abroad. During the war he worked in conjunction with various Service Departments on matters concerning transmission and distribution. He is particularly well known in the oil, metallurgical and sugar industries, with which he has long been associated on behalf of J. and P., and for his work on B.S.I. committees. He received early technical training at Rutherford Technical College, Newcastle-on-Tyne, and before joining J. and P., served an apprenticeship with J. H. Holmes and Co., Ltd.

Mr. E. F. Ward

Dr. W. Abbott, C.M.G., O.B.E., formerly H.M. Staff Inspector of Engineering at the Ministry of Education, has been appointed director of studies in connection with the F.B.I. Overseas Scholarships Scheme. **Mr. W. V. Jenkins,** who has been responsible for the operation of the scheme since its inception, remains manager. The first two groups of scholars from Latin America have now arrived and begun their training at engineering works in this country. Four are from Peru and three from Cuba. Scholars from other Latin American Republics are expected shortly. Three more Indian scholars have also begun their training, giving a total of 26 graduates who are receiving their training under the F.B.I. scheme. Six have already returned home after completing their training. The Scholarship Scheme now embracing Australia, India, Pakistan, Chile, Cuba, Peru, Iran and Sudan is in process of being extended to other British territories and certain foreign countries, especially in the Middle East.

Among Brighton's three new Justices of the Peace, announced last Friday, is **Mr. H. Pryce-Jones,** M.Eng., M.Inst.C.E., M.I.E.E., M.Inst.F., who is well known in our industry as manager of the Mid-Sussex sub-area of the South Eastern Electricity Board. Prior to nationalisation, of course, he was chief engineer and manager of the Brighton Corporation electricity undertaking, and was responsible for the design and early construction of the new Brighton "B" power station.

Chosen for the post of district manager at Staines to the Southern Electricity Board is **Mr. N. M. Wallace,** A.M.I.E.E., A.M.I.I.A., A.M.I.B.A.E., who at present is district manager for the King's Lynn and Western district of the Eastern Electricity Board. Educated at Bedford Modern School, he gained early training with the Bedford Corporation electricity undertaking before joining the Dumfriesshire County Council Electricity Department, with which he served as assistant mains and meter engineer and subsequently district engineer for the Annan district. With the nationalisation of the industry he continued in the latter position with the South West Scotland Electricity Board, before coming south to King's Lynn. During the war he was with the Royal Signals, becoming, after various promotions, officer commanding, District Signals.

Mr. N. M. Wallace

Last week brought the retirement of **Mr. Edward Binns,** M.I.Mech.E., A.M.I.E.E., sub-area manager of the North Western Electricity Board's No. 3 Sub-Area, based on Oldham. He had served at Oldham since 1914, having joined the corporation undertaking as charge engineer. He later became successively boiler house superintendent, power station superintendent, joint chief engineer and manager, with Mr. R. G. Whitehead, and ultimately chief engineer and manager of the undertaking. As we reported last May, the Board's new sub-area manager at Oldham is **Mr. F. J. Cole,** M.I.E.E., M.I.Mech.E., who formerly held a similar post at the Board's No. 7 Sub-area.

Education officer of the Institution of Electrical Engineers, **Mr. W. H. Taylor,** B.Sc., A.M.I.E.E., will be joining the General Electric Co., Ltd., in the New Year as controller, education and personnel services.

For the post of generation engineer (operation) central group, of the Yorkshire Division of the B.E.A., **Mr. P. E. Austin,** B.Sc., A.M.I.E.E., A.M.I.I.A., has been selected. He has been station superintendent at the Division's Keadby generating station since October 1951, taking up that appointment before the station went into commission. Earlier, he was station superintendent at Mexborough for about 18 months after holding a similar post at Barugh power station. He started his career with the Yorkshire Electric Power Co., Ltd., with which he served in various capacities.

Mr. Ralph Fenwick has recently joined the Telegraph Construction and Maintenance Co., Ltd., of Telcon Works, Greenwich, as technical sales representative for the North Eastern Area. Mr. Fenwick was formerly development manager with Morganite Resistors, Ltd.

Mr. R. Fenwick

E. K. Cole, Ltd., announce that **Mr. L. Pratt** has been appointed car radio sales representative for the South-western territory of England. During his 27 years' connection with the radio industry, Mr. Pratt has held technical and sales appointments with Kolster-Brandes, Ltd., A. C. Cossor, Ltd., and Radiospares, Ltd.

The National Coal Board have appointed **Mr. J. M. Pumphrey,** M.B.E., T.D., as production director of the Northern (N. & C.) Division of the Board, in succession to **Mr. R. D. Glass,** who is leaving to take up a senior mining position in South Africa.

Mr. T. R. Evans, M.I.E.E., who retired last month from the position of district commercial manager at Porth, Rhondda, to the South Wales Electricity Board, was recently presented with gifts from his former colleagues.

At the annual dinner of the Radio Industry Council last week, **Sir Noel Ashbridge,** former director of technical services to the B.B.C. was presented with a portrait of himself by Mr. F. O. Salisbury, in recognition of his contribution to the growth of British broadcasting. Presentation was made by Lord Burghley, president of the council.

Chairman and managing director of the Rheostatic Co. Ltd., **Mr. Maurice J. Gartside,** left the U.K. by Comet for a business visit to South Africa recently. He will be spending some time with the company's subsidiary concern, Contactor (Pty) Ltd., at Zuider Paarl in the Cape, in addition to visiting branch offices and customers in South Africa and Rhodesia before returning to England early in the new Year. On his return he plans to visit some Balkan countries to investigate market possibilities there.

Smiths Industrial Instruments Ltd. have appointed **Mr. M. D. Davidson** as their Scottish technical sales representative. He will operate from 153/155 Bothwell Street, Glasgow C.2.

A director of the Baghdad Light and Power Co. Ltd., for the last twenty years, **Mr. S. H. Taylor,** V.D., has now retired, having reached the age of 75 years. Before joining the Board in 1933, he had held other responsible positions with various electric supply companies in India.

Mr. E. Chartier has been appointed assistant to the superintendent of the Transmission Line Division of the Shawinigan Water and Power Co., Ltd. Since 1938 he has been superintendent of No. 6 District of the company's generation and transmission department.

For the last four years manager of the Glasgow office of the Rheostatic Co., Ltd., **Mr. B. J. Bradford,** A.M.I.E.E., has been appointed publicity manager of the company, operating from the head office at Slough. He has been with the company since 1947.

OBITUARY

Mr. C. M. Thomas, transmission section engineer at Poole to the Southern Division of the B.E.A., died recently, aged 63. He was apprenticed in 1908 to the British Colliery Co. and became engineer-in-charge at the Coytralion Colliery in 1915, where he stayed until 1928. After two years as switchgear erector with Guest, Keen and Baldwins, he went to W. T. Henley's Telegraph Works Co. Ltd. as section engineer, subsequently being an assistant section engineer with the Central Electricity Board from 1932 to 1948.

Mr. R. S. Dyball, who died on November 18, aged 61, was chairman of Hills (West Bromwich) Ltd. and a director of a number of companies, including Constructors Ltd., and Douglas (Kingswood) Ltd.

Mr. J. H. Castell, designer of the special locks and interlocks for electrical switchgear, died on November 9, aged 73. After early training he joined the British Thomson-Houston Co., Ltd., in 1905, being responsible for the switchgear section of the drawing office. When the Switchgear Department was transferred to the Willesden works in 1913, he became chief draughtsman, holding that position till 1919, when he went into business on his own account, specialising in locks. He retired in 1949, but continued to act as consultant for Castell Locks, Ltd.

Mr. L. St. L. Pendred, C.B.E., who died on November 21, aged 82, was for 40 years editor-in-chief of *The Engineer* (retiring from that position in April 1946) and a past-president of the Institution of Mechanical Engineers.

Mr. L. Mellor, M.B.E., J.P., M.I.E.E., A. Reyrolle & Co.'s area manager for North-East England and Northern Ireland, died on November 22. He began his career with the company as an apprentice in 1904, and following early training he spent a number of years superintending the erection of switchgear, both at home and abroad. In 1921 he returned to Hebburn as area manager and was intimately connected with all the work associated with the old Newcastle Electric Supply Co. He also supervised the contracts and engineering on a number of important power stations. He was hon. secretary, North Eastern centre of the I.E.E. for many years and chairman in 1948.

BRITISH STANDARDS

British Standards for Workshop Practice. *B.S. Handbook No. 2: 1953. Price 21s. net.* Under the general editorship of J. E. Baty, M.I.Mech.E., M.I.P.E., A.M.I.E.E., this volume makes a welcome return after its two previous appearances, in 1943 for the first time, and in revised form three years later. Collecting all Standards affecting engineering practices in workshops, the handbook places in the hands of executives, draughtsmen, engineers such Standards likely to be needed from day to day in a concise and handy form. In scope, it covers limits and fits, screw threads, gauges, bolts, nuts and metal thread screws, cutting tools and machinery details.

Notable changes in this edition include the introduction of Standards for unified threads, bolts and nuts, and, of particular importance, the recently issued B.S. 1916 "Limits and Fits," although it is emphasised B.S. 164 will also remain in use for some time to come. Many revisions of Standards which have taken place since the war have also been made in the book.

Enamelled round copper wire (Enamel with vinyl acetal base). Metric units. *B.S.2039:1953. Price 4s. net.* Prepared primarily from the point of view of imports, this standard is a metric edition of B.S.1844 of the same title. It differs from that standard in that all quantities are expressed in metric units, the wire diameters ranging from 0·05 mm. to 4 mm. All technical details are taken from B.S.1844, but there is an additional appendix which gives constants for converting resistances of annealed, high conductivity copper at various temperatures to the standard of 20°C. For normal purposes in the U.K., B.S.1844 is still the appropriate standard.

Copies of the above British Standards may be obtained from the Sales Branch of the British Standards Institution, 2 Park Street, London, W.1, at the prices stated.

An Investigation in the Isle of Man

A COMMISSION is to be appointed to take evidence and investigate the generation and sale of electricity in the Isle of Man and to "make recommendations with a view to ensuring that the public receive an adequate supply at the cheapest possible price." This was decided upon by Tynwald last week in a debate which, at times, was very spirited, it seems. The decision followed discussion on a proposal by Mr. Cowin, who said that the report of the Hydro-Electric Commission in 1948 advocated that an authority be set up for joint generation, and for control of the island's electricity supply.

Declaring that the Isle of Man Electricity Board was paying its way, Mr. Corrin, chairman of the Board, said that so far as the Board were concerned there was no need for a Commission, but the Board was willing to be co-operative with the Electricity Committee of the Douglas Corporation. Mr. Kerruish thought that this was another attempt to cut the liability of Douglas for generating electricity and to pass it on to the whole of the island.

The Speaker, Mr. J. D. Qualtrough, said that the Electricity Board had been criticised for having created a position in which two people were blindly losing money through stupidity and inability to work together. This was not true, he declared. The Board partly welcomed, and the Corporation rejected, the Nimmo Report suggesting that there should be one authority for generating and distributing electricity. The trouble between those two bodies existed before the war. The Board were compelled in the interests of consumers outside Douglas to set up their own station. (There was much argument around 1939/40 concerning charges for bulk supplies given by Douglas Corporation.) The Board's average price of 2·14d. per unit compared with the Corporation's 2·37d., he went on. The Corporation had been guided to some extent by a rather blind prejudice against diesel generators. Here Mr. Cowin interrupted to say that he had never suggested that the fault lay anywhere. Mr. Qualtrough went on to suggest that a solution might be for the Douglas power station to be closed down and the plant sold, leaving the Corporation to take a supply from the Board.

Another member, Mr. A. J. Tearle, pointed out that Douglas Corporation, under the impression that they had to continue to supply the whole of the Island, had ordered extensive new plant. The "ridiculous" position of having two generating stations on the Island to serve 50,000 people was also referred to by other members.

(Note: The Isle of Man Electricity Board serves an area of 280 sq. miles, with a population of 25,000, and has 7,520 kW of diesel plant. The Douglas Corporation undertaking also serves about 25,000 people in 17 sq miles, and has 11,725 kW of steam generating plant).

NEW LITERATURE

Small Transformers and Inductors

by K. A. MacFadyen, M.SC., F.INST.P.

APART from power and communications transformers, increasing use is made nowadays of those units designed to handle pulses of only a microsecond in duration, but having peak powers approaching a megawatt in value. Such is the scope of this useful little book, that the author attempts to encompass all three types of transformer, for the guidance of the non-specialist engineer who wishes to design and construct with confidence, transformers for such varied purposes. Mathematically, the book is not too heavy, and engineering degree students should master all mathematical discussions without great difficulty. Moreover, readers are likely to find the preference for "synthetic" methods of design (in which main design features are predicted directly from requirements, as against the usual analytic method) of considerable value. In its scope, the book introduces the subject by discussing design principles, leading to an exhaustive section on circuit theory, and the magnetic circuit. Equivalent circuits for imperfect transformers are then thoroughly explored, followed by a consideration of effects of such imperfections. After discussing inductances, the book then comes to grips with transformer design, taking power, instrument, magnetically polarized, high Q and pulse transformers in its stride, concluding with mechanical design construction and material considerations and various appendices. Published by Chapman and Hall, 237 pages, 8½ in. by 5½ in. Price 37s. 6d.

The Price of Fuel

by I. M. D. Little

IF a system of tariffs had been adopted which made space-heating uneconomic, electricity supply could long since have caught up with demand with a greatly reduced investment programme. That statement sums up the tenor of this provocative book, which has been written by a professional economist to present his beliefs that the Ridley Committee did not go far enough, and that thermal and economic efficiency are not the same thing: that capital is a scarce resource as well as coal.

The book is divided into four parts. Coal prices are discussed first, with the conclusion that they are too low, and should be raised steeply. Next comes a consideration of the domestic and commercial use of fuel in which the electricity industry comes under heavy attack for not introducing a time-of-day tariff; and in which the author reveals his bias in apparently accepting what the Coal Utilisation Council says as unquestionable truth, while regarding statements from electrical sources as highly suspect. For his third section the author discusses industrial and bulk supply tariffs in electricity, in which he solves with disarming simplicity the question of payment for stand-by supplies. Finally, he presents the product of it all—his dear coal, anti-electrical national fuel policy.

This is a restrictive book. It ignores many lessons from the past. It seeks to curb the growth of electricity and to expand the uses of gas and solid fuels with all their inconveniences. But it is not a book to be ignored. Many of its points are well argued, and the exercise of finding their fallacies and the weakness of their technological basis is well worth the effort it requires. For the electrical enthusiast it is an infuriating book, but the soul-searching it can excite will leave him better able to answer the many attacks he must bear. Published by the Clarendon Press, Oxford, 197 pages, 8½ in. by 5½ in. Price 12s. 6d.

Battery Chargers and Charging

by Robert A. Harvey

LEAD acid and the alkaline types of battery have a long history going back to the beginning of the electrical industry. Although they no longer play a prominent part directly in power supply, their importance has been no wise lessened. In fact, it may well be said that the whole of modern transport is dependent (as many a motorist is bitterly aware), on the battery. In his book, Mr. Harvey is at particular pains to explain the particular functions of batteries in various applications, ranging from battery-propelled electric vehicles to miners' lamps, and from power station switchgear tripping batteries to aircraft units. He also goes deeply into the problems of correct charging and describes the various methods adopted for differing functions. The book has the twin virtues of being easily understood and of being well illustrated, particularly with typical curves.

Practical advice is abundant and essentially the volume is designed to appeal to the practical man. Published by Iliffe and Sons Ltd., 400 pages, 5½ in. by 8½ in. Price 35s.

BOOKS RECEIVED

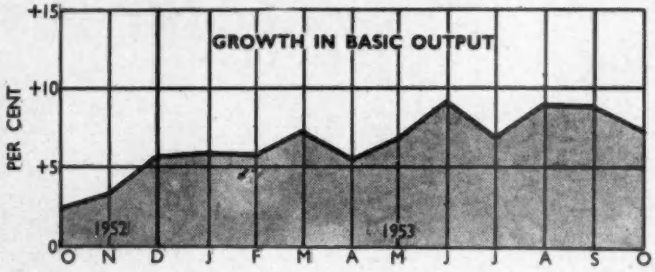
Practical Electrician's Pocket Book 1954 ed. by R. C. Norris. Keynote of this year's edition is the contribution made by the electrician to increased productivity. Published by Odhams, 540 pages, 5½ in. by 3¾ in. Price 5s.

Machine Tool Operation, by H. D. Burghardt and A. Axelrod. Discusses construction, operation and use of standard machine tools for students and apprentices. Published by McGraw-Hill, 585 pages, 9 in. by 6 in. Price 30s.

The J. and P. Switchgear Book by R. T. Lythall. Revised edition, includes new chapters on oil-immersed FLP switchgear and surge protection. Fifth edition, published by Johnson and Phillips Ltd., Charlton, S.E.7, 753 pages, 8½ in. by 5½ in. Price 35s.

BASIC LOAD GROWTH

In the accompanying curve is shown how energy sold by the B.E.A. in the past 12 months compares with that of the corresponding month a year earlier. Figures used for plotting are first corrected for the effects of temperature and of the number of working days included in the calendar month. Thus the points marked are an approximate measure of the basic rate of load growth experienced by the B.E.A.



Power Supply in October

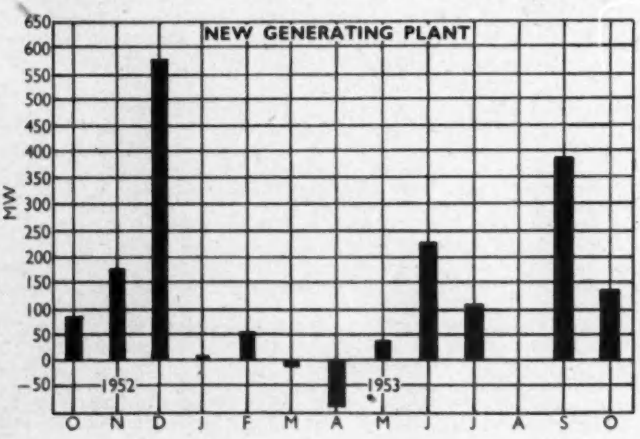
TWO boilers and two sets, showing an increase of 90 MW in generating capacity and 360 klb/hr in evaporative capacity, make up last month's comparatively unimpressive record of commissioning by the B.E.A. Of the sets, the larger is a 60 MW Parsons turbo-alternator at Littlebrook C generating station in the S. Eastern Division running from 360 klb/hr boilers of International Combustion manufacture; it is the second set for the station.

In the South Western Division, the installed capacity of East Yelland station rises by the 30 MW of the other turbo-alternator, which is also of Parsons manufacture. This station also records one of the two boilers, a 180 klb/hr unit by John Thompson. This is the fourth boiler for the station whilst its total of sets is now two. Finally, Yorkshire Division benefits by an increase of evaporative capacity of 180 klb/hr resulting from the commissioning of the second Mitchell boiler at Doncaster.

Turning now to sales of energy during October, it is seen that nationally, these were 5% above those for the same month last year. When allowance is made for the effec-

B.E.A. SALES TO AREA BOARDS IN OCTOBER

Board	Oct. Sales in million units	% inc. or dec. on Oct. 1952
London	490·9	+ 0·5
South Eastern ...	289·7	+ 6·1
Southern	341·8	+ 5·3
South Western ...	169·5	+ 9·6
Eastern	472·8	+ 4·2
East Midlands ...	407·6	+ 3·4
Midlands	554·3	+ 2·9
South Wales	318·3	+11·3
Merseyside and N.W.	304·7	+ 5·2
Yorkshire	540·5	+ 3·0
North Eastern ...	321·8	+ 2·6
North Western ...	608·2	+ 7·8
South-East Scotland...	115·5	+ 5·6
South-West Scotland	277·5	+ 3·4
Direct Sales by B.E.A.	86·1	+37·5
Grand Total ...	5,299·2	+ 5·0

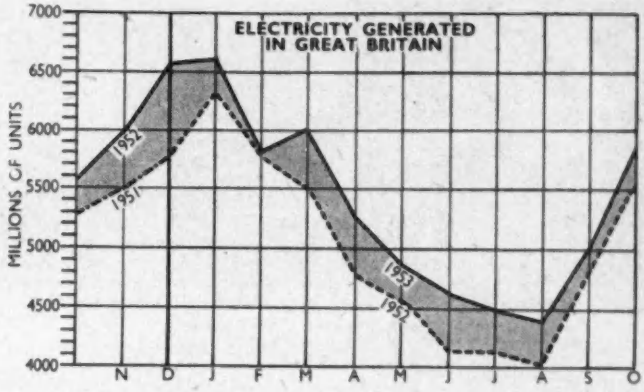


GENERATING PLANT

At the end of October, 1953, the installed capacity of the B.E.A. was 18,028 MW, showing a change of 133 MW during the month. During the same period that of the North of Scotland H.E. Board increased by 1 MW to a total of 566 MW.

The overall increase during the past twelve months is 1,599 MW or 9·4% of the total at October 31st, 1952. The B.E.A. total is up by 1,593 MW and the North of Scotland total by 6 MW.

The total installed capacity used for the purposes of this graph is the total m.c.r. of all generating sets which are connected on both steam (if appropriate) and electric sides and are suitable for service.



UNITS GENERATED

Total generation during October amounted to 5,828 million units in stations under the control of the British Electricity Authority and the North of Scotland Hydro-Electric Board. Last year's corresponding figure was 5,527 million units.

Of the October total, 5,686 million units were generated in steam stations, whilst the contribution from hydro-electric stations was 128 million units.

Energy sent out by both authorities during the month totalled 5,483 million units, 94% of that generated.

tive number of working days (slightly less this year) and for warmer weather conditions (an average temperature of 53·2° F as against 50·1° F last year), the increase becomes 7·4%. In effect, this was the basic growth of load experienced by the Authority last month, and although a little less than in the last two months, its value reflects the more reasonable position the supply industry has now attained in this respect after last year's recession.

Results of individual Boards give little scope for discussion. Generally, those Boards in which more than half their total energy sales were to industrial consumers, displayed a tendency to have lower increases than those in which other consumers predominated—probably resulting from the effect of fewer working days. On the other hand, the North Western Board's figure of 7·8% indicates the renewed demand of the textile industry, and the low increase of 0·5% recorded by the London Board is probably accounted for almost entirely by the higher temperatures prevailing.

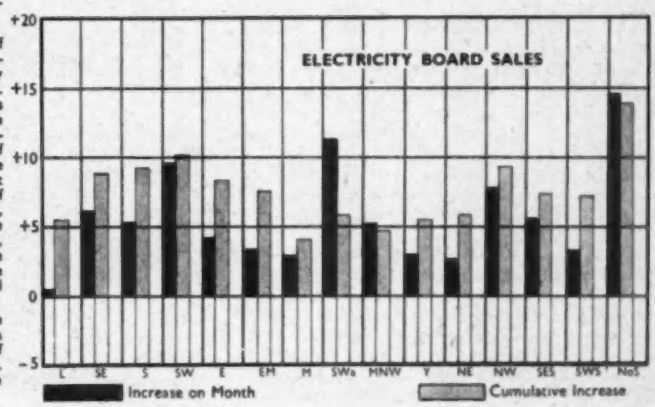
Coal Stocks

When mention was last made of the position of coal stocks in the country, they had been running consistently lower than in the previous year. Over the last few weeks however, those of power stations have increased to the value they held 12 months ago —6·26 million tons—although consumption has been generally higher. For October 1953, it averaged 722 thousand tons/week compared with 704 thousand tons/week for the same month last year. Nationally the picture also shows an improvement: whereas coal stocks were some 1·14 million tons below the 1952 figures 8 weeks ago, they had risen to 0·68 million tons less at the end of October, totalling 18·8 million tons.

OCTOBER SALES

Progress in the sales of energy by the British Electricity Area Boards and by the North of Scotland H.E. Board is represented in this diagram. For each entry the two columns indicate, respectively: the bulk supply of electricity taken by the Board (or the total sent out to Areas for the North of Scotland) in October, 1953, expressed as a percentage increase on that in October, 1952; and on the same comparison for cumulative totals based on the financial year.

It should be noted that the B.E.A. financial year runs from April 1, whilst that of the North of Scotland H.E. Board corresponds to the calendar year.

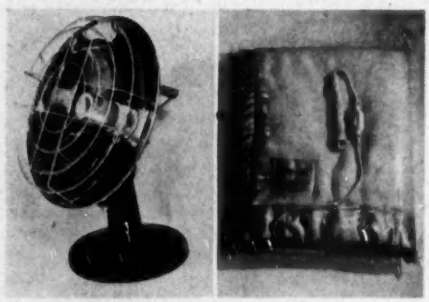


The BUYER'S *Column*

Hotpoint Introductions

TWO new items added to the range of domestic goods marketed by the HOTPOINT ELECTRIC APPLIANCE CO. LTD., Fletton, Peterborough. First is the popular 30C bowlfire with chromium-plated copper reflector and safety guard to BS.1670. List price is £2 5s. plus purchase tax of £1 4s. 9d. With black enamel base, the fire is rated at 600 W.

The second addition is a new electric blanket which measures 54 in.×30 in. and is made from best quality hard-wearing woollen material. A deep matching satin ribbon binds the blanket on both sides; 9 ft of twin flexible cable in cream lustre is specially anchored inside the blanket. In this cable is an easy finger action on-off line cord switch. Rated at 75 W and interference free, this new line is priced £6 5s. plus £1 2s. 10d. purchase tax. A matching washable cover can be supplied at a list price of £1 5s. 0d.



Hotpoint's fire and new blanket

G.E.C's Latest 60 A 500 V Switch

AN all insulated switch rated at 60 amps 500 V a.c. has been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.

It is double pole and available in two forms. One X 1616FE has front entry terminals with an extended cover and the other X 1616BE has back entry and a short cover. Both forms are fitted with earth connections and have provisions for sealing.

The extended cover on the front entry version has been introduced to comply with I.F.E. regulation 404J requiring that the stripped cable core should be covered. Both are moulded in phenolic plastic and have clear "on-off" indication. On test the switch operated 15,000 times breaking 60 amps at 550 V, unity P.F. 50 c/s., and was still capable of further service. Similarly the switch was found to have a high overload rupturing capacity being capable of rupturing 250 amp at 550 V, unity p.f. and 140 amp 550 V 0·4 p.f.

Fire Retarding Compound

OXYLENE Boram fire retarding coating has been specially developed to meet situations where protection of timber products, acoustic tiles and other insulation materials is required but impregnation of the elements involved is impracticable.

A phosphate resin compound based on antipyrine chemicals Oxylene Boram is supplied in powdered form which with the addition of water forms a mixture suitable for application by brush or spray. It gives a white durable and non-flaking finish.

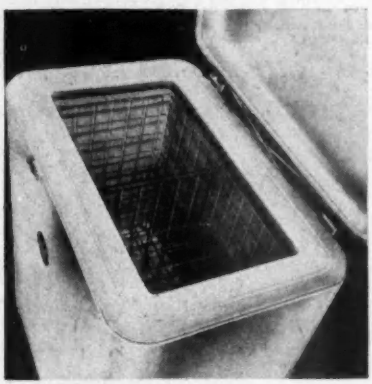
Fuller details are available from THE TIMBER FIREPROOFING CO., LTD., Market Bosworth, Nuneaton.

New Prestcold Home Freezer

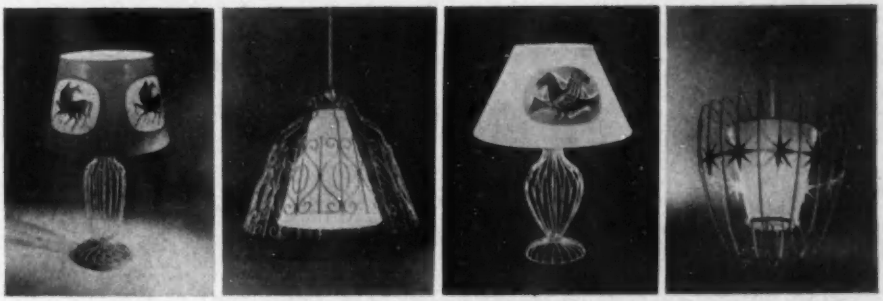
RECENTLY added to their range by PRESSED STEEL CO., LTD., Cowley, Oxford, the model H.F.41 Prestofreeze Junior Home freezer sells at £87 plus £30 4s. 6d. tax, a total of £117 4s. 6d.

Its storage capacity is 4·05 cu. ft or an average capacity of 120 lbs of food. Following generally the construction embodied in other Prestcold units the H.F.41 had the Presmetic refrigeration unit incorporating a ⅓ h.p. split phase motor driving a single cylinder compressor. Automatic temperature control is fitted.

Special features are the counterbalanced lid, the chromium plated grip-type locking handle, four produce baskets, a hermetically sealed refrigeration unit guaranteed for five years, automatic protection against overload, and dry wall



This home freezer has great capacity



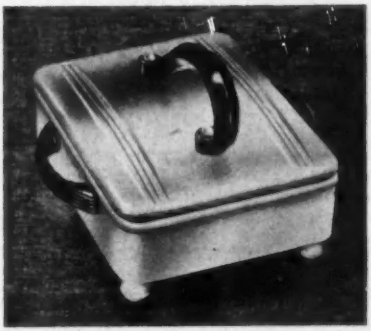
New models from the G.E.C. Gossamerlite range

freezing with coils completely surrounding walls and floor.

"10 Second Toaster"

AN unusual type of toaster has been introduced by INDUSTRIAL MACHINERY AND APPLIANCE CO., 11 King St., Wolverhampton.

The toaster is a horizontal dish type unit in which the toasting is accomplished by the bread being in actual contact with a pair of heated plates. The heating elements are either of the



Horizontal contact toasting is timed for 10 seconds

mica (iron) type or embedded in the heating plate casting.

The elements, which are thermostatically controlled to keep the operating temperature for 10 seconds time, are rated at 900 watts. One is horizontally mounted in the lower section of the heater, the bread is placed on this and the second heating plate is lowered on to the upper side of the bread. This upper heating plate is provided with heat-resisting handle and is lowered or raised by special hinged action which allows the top plate to be accommodated to any thickness of toast.

Irregularities in cutting slices of bread are "ironed" out by the slight pressure by weight of the upper heating plate. This produces an even toasting effect throughout the slice.

Finished in polished chromium plating with heat-resisting feet and handles, with 6 ft of three-core flexible cable, the toaster's retail price is £2 15s.

Modern Fittings to Suit all Homes

MODERN style fittings introduced recently by the GENERAL ELECTRIC CO. LTD., Magnet House, Kingsway, W.C.2, will be welcomed by a large number of people who want to bring their lighting schemes up to date without great expenditure.

Three of the fittings are offered as a set costing £7 16s. plus 25s. purchase tax and comprise a pendant fitting for a sitting- or dining-room, a hall lantern and a table lamp for a lounge. These are similar to a range of eleven new decorative lighting fittings designed for the G.E.C. by Beverley Pick, M.S.I.A., but have natural-coloured pleated parchment shades in the lamp and pendant whilst the lantern cone is made of oiled card with mustard binding.

The new range of eleven fittings employ the same white enamelled shaped wire construction but have gaily coloured shades which are luminous but not loud. All these fittings with the exception of one model F38050 are available with the wire stove enamelled in alternative colour to white of mustard, pebble, blue or cherry red, whilst the four lanterns have white cone interiors and wires in the same range of colours as the table lamps. The "Gossamerlite" range currently advertised is priced from £3 10s. to £5 17s. 6d. including tax.

Pyramid Tea Sets for Christmas Market

TWO well-finished tea sets designed as an ideal Christmas gift have been put into production by PYRAMID ALUMINIUM WARE (Hague and McKenzie Ltd., Sloane St., Birmingham, 1).

The sets consist of teapot, hot water jug, cream jug, sugar basin and tray. They are of highly polished aluminium, which will keep its original lustre for years, and conform to the usual Pyramid high quality.

The teapot in the Afternoon Tea Set illustrated (p. 1016) holds one pint, the hot water jug half a

pint, and the tray, patterned round the rim only, is 12 in. in diameter.

The set, packed in an attractive box, retails at 69s.

Ready for Christmas gift-making

In every way similar, but more rounded in "pot" design, the Early Morning Tea Set has a teapot capacity of three-quarters of a pint and retails at 63s.

New Models in the "Variac" Range

A RECENTLY produced supplement to Catalogue V.549 issued by CLAUDE LYONS LTD., 180 Tottenham Court Road, London, W.1, gives details of an entire range of automatic voltage stabilisers in sizes varying from 200 VA to about 25 kVA (see ELECTRICAL TIMES, 19 Feb. 1953).

There are also new types of Variac transformers. The Duplex-output 100/RM/2B 2 kVA Variac transformer first introduced in 1947 proved a major success but there has been a demand for a smaller load-rating instrument of similar design and consequently the firm have introduced the "200" range.

These are similar to the larger models but have a 270 V winding with 230 V input in the 200 CMH/2B and 200 CUH/2B (unmounted) with 2·5 amp maximum current-carrying capacity and 135 V winding with 115 V input and 7·5 amp max. capacity in the 200 CM/2B and 200 CU/2B types. Prices for the four models respectively are: £11 5s., £9 15s., £9 10s. and £8 5s. all plus 20%.

TRADE PUBLICATIONS

SILICONE RUBBER.—Midland Silicones Ltd., 19 Upper Brook St., London, W.1, have issued a leaflet entitled "Where to buy products made from 'Silastomer'."

ALLOYS.—Machining notes for "Hidumium" and "Magnumium" alloys have been issued in pocket brochure form by High Duty Alloys Ltd., Slough, Bucks.

TEXTILE DRIVES.—Two recent "English Electric" brochures deal with electric drives for textile machinery; they are "Small Induction Motors for Loom Drives" and "The Power Behind the Wool Industry," and are available from English Electric Co. Ltd., Foregate Street, Stafford.

VOLTAGE CONTROL.—A catalogue of Fox toroidal potentiometers has now been issued by P. X. Fox Ltd., Hawksworth Road, Horsforth, Yorks.

SCRAP METAL.—George Cohen and Sons and Co., Ltd, Cunard Works, Chase Road, N.W.10, have issued a topical leaflet printed in two colour "3-D."

LIGHTING FITTINGS.—Metway Electrical Industries Ltd., 21 King Street, Brighton, Sussex, have now published an "Industrial Fittings" catalogue.

PLASTICS.—"Mouldings in Bakelite Materials" is a self-explanatory title to a recent brochure which they have published.

RELAYS.—We have received a copy of the new catalogue issued by Hendrey Relays Ltd., 392 Bath Road, Slough, Bucks. It is an attractive loose-leaf publication containing details of 31 items from the company's range.

BOILERS AND GENERATING PLANT.—Richardsons, Westgarth (Hartlepool) Ltd. have issued a folder showing how they serve in the supply of power for industry.

CONTROL EQUIPMENT.—New data sheets, Nos. 1, 2, 3 and 4, have been issued by Sunvic Controls Ltd., 10 Essex St., Strand, W.C.2. These replace eight leaflets issued earlier by the firm.

LIGHTING.—"New Lights from Old Chelsea" is the appropriate title of a folder showing a range of contemporary lighting fittings produced by H. C. Hiscock Ltd., 55 Old Church Street, Chelsea, London, S.W.3.

GENERAL.—New catalogue bender design to incorporate all the company's standard leaflets has been issued by Revo Electric Ltd., Tipton, Staffs. It is bound in loose-leaf style in green cloth.

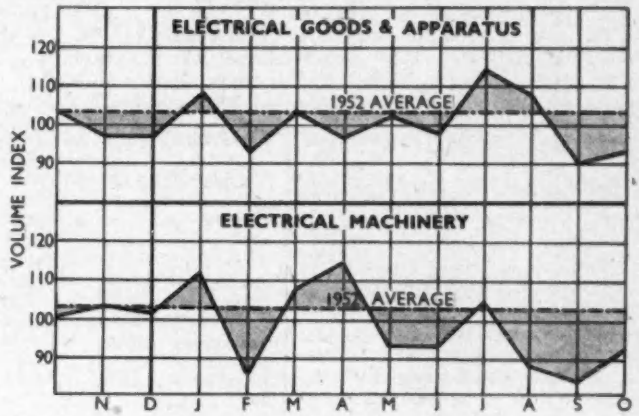
PURIFICATION.—To present a general idea of the purifying machines available, Wallace and Tiernan Ltd., Power Road, London, W.4, have published a leaflet (S/109) which gives in digested form particulars of the various instruments.

DIESEL ENGINES.—An attractive folder, Number DE/179, entitled "English Electric Rail Traction Diesel Engines," is available from the company's Diesel Engine division at Brownsover Hall, Rugby.

FANS AND EQUIPMENT.—A well planned general catalogue of fan and air conditioning equipment has been published by Fenton, Byrn and Co. Ltd., Airflow Work, Berrylands Road, Surbiton, Surrey. It surveys their "Air-flow" range of equipment.

LIGHTING.—"The facts and figures behind the outstanding performance of Atlas double-life fluorescent tubes" is the title of a leaflet available from Thorn Electrical Industries Ltd., 233 Shaftesbury Avenue, London, W.C.2.

EXPORTS AND IMPORTS



EXPORTS VOLUME INDEX

Last month's exports of electrical manufactures recovered somewhat from the fall in September, although in both classes exports were still below last year's average. For electrical goods and apparatus, the rise in exports is shown by the Volume Index, which now stands at 93, although at the end of October, 1952, it was 103, both figures based on 1950 as 100. Where electrical machinery is concerned, the rise is more marked, last month's figure of 93 (1950=100) being 10 points above that for September, but, however, below that of the corresponding month last year. In value, exports in the first class amounted to £8,248,532, and in the second class to £4,533,797.

A WELCOME increase in the value of all electrical goods exported during the month of October is recorded in the latest Board of Trade statistics. The total of £13,448,523 was over £1·3 million up on the corresponding figure for September, and about £1·1 million higher than in August. But there is still much leeway to be made up to attain last year's high totals.

Exports of electric washing machines up to 150 lb in weight amounted to £310,834 in value during October, and of the larger models, £98,891—both totals being little variation from those of the previous month. Portable electric tools exported amounted to £137,342 in value.

Description	Exports Value Month of October			Imports Value Month of October		
	1951 £	1952 £	1953 £	1951 £	1952 £	1953 £
Telegraph and Telephone Wires and Cables—						
Submarine	39,723	175,904	106,492	—	—	—
Other	350,213	737,728	450,696	—	—	—
Rubber Insulated	669,368	494,731	338,914	—	—	—
Insulated, other than Rubber	1,025,342	1,559,134	876,611	—	—	—
Wireless Apparatus, including Valves	1,949,097	1,962,386	2,470,055	325,583	319,757	530,063
Telephone and Telegraph Apparatus	1,341,773	1,667,532	1,317,884	—	—	—
Electric Lighting Appliances, Accessories, Fittings and Parts—						
Filament Lamp Bulbs	152,007	90,257	91,310	14,000	7,875	11,900
Other Descriptions	453,861	437,287	443,858	80,257	84,051	32,604
Batteries (primary)	239,580	211,863	227,571	—	—	—
Accumulators, Portable	441,799	216,654	195,916	—	—	—
,, Stationary	41,515	48,852	51,952	—	—	—
,, Parts and Accessories	95,013	58,207	29,441	—	—	—
Electrical Cooking and Heating Apparatus	505,846	320,104	335,073	—	—	—
Ammeters, Voltmeters, etc., and Parts	122,296	150,174	174,048			
House Service Meters	145,730	117,364	81,003	40,087	51,970	56,484
All Other Instruments	136,401	136,272	122,771			
Electro-Medical Apparatus	39,875	34,355	33,123	—	—	—
X-Ray Apparatus, etc.	215,755	141,001	128,036	32,689	27,710	30,208
Insulating Materials	250,019	124,530	129,667	—	—	—
All Other Articles	619,491	643,632	644,711	154,290	193,293	119,741
TOTAL OF GROUP	8,808,704	9,327,630	8,248,532	646,906	684,656	771,000
Electrical Machinery:—						
Generating Sets, Diesel (not exceeding 200 kW)	487,433	298,119	316,404			
,, ,, ,, (exceeding 200 kW)	73,031	404,036	84,720	28,346	72,955	10,502
Other Generating Sets	331,410	110,741	233,053			
Generators minus Prime Movers and Parts	501,546	496,520	615,907			
Motors	914,949	830,318	763,089	26,322	39,740	46,295
Convertors, Transformers, Rectifiers, Motor Control Gear, Switchgear, other machinery	2,552,286	2,946,886	2,619,417	24,857	39,701	120,991
Fans, Electrically and Power Driven	231,035	255,069	223,092	—	—	—
Vacuum Cleaners or Electrically Operated Appliances	786,135	422,094	344,309	—	—	—
TOTAL APPLIANCES AND MACHINERY	14,686,529	15,091,413	13,448,523	726,431	837,052	948,788

The WEEK in NEWS

Co-ordinate Fuel Industries

Manufacturers' Union deprecates Duplication

A RESOLUTION urging the Government to co-ordinate the functions of the fuel and power industries in order to eliminate waste and duplication, elicited numerous comments at a recent meeting of the Merseyside and N. Wales branch of the National Union of Manufacturers. The question arose because of the level of coal stocks and the rise in costs of fuel and power. Some members were in favour of a co-ordinated policy by the nationalised undertakings. They sought an authoritative statement as regards the nation's fuel policy, a directive as to whether electricity would be generated atomically and so replace gas, whether the Government was doing anything about the efficient burning of coal, and whether they were going to utilise waste heat.

Those who have been following the controversy concerning the installation of electricity or gas on new housing estates, will probably note with interest that the competition aroused was deprecated. One member urged that the Government be asked to eliminate duplication and instanced new housing estates. Was it absolutely necessary, he asked, to have both gas and electricity installed in new houses? Another member pointed out that co-ordination tended to cut out competition, which he believed to be vital to industry, especially in reducing costs. Resolution was passed.

New Company to Manage B.I.F.

THE B.I.F. is to be managed by a new private corporation instead of by the Board of Trade. Responsibility for the London section is to rest with the new body, whilst the Birmingham section will remain the concern of the city's Chamber of Commerce. This was announced by Mr. P. Thornycroft on Tuesday. This new corporation will be in the form of a company limited by guarantee and at the outset will have a chairman and six other members. At present it is intended to appoint presidents of the Association of Chambers of Commerce, F.B.I., N.U.M., and T.U.C. as ex officio trustees. These arrangements will apply to the 1955 Fair—those for next year's show remain unaltered.

Life in A.D. 2000

UNDER the above heading a competition is being arranged by the Royal Society of Arts as one of the celebrations of the Society's bicentenary next March. Contestants are required to submit their forecasts of a single aspect of life at that period. Thirteen prizes totalling £500 are being offered.

Electrical Firms Planning Trade Visit to Moscow

THERE have been numerous reports during the past week of an intended visit to Moscow of leading electrical manufacturers. We understand that plans for such a mission are still going ahead, although members of the party will travel individually and not, as originally envisaged, under the auspices of the British Council for the Promotion of International Trade, which has been severely criticised, notably by the Foreign Secretary. An announcement concerning final arrangements for the trip is expected shortly from Crompton Parkinson Ltd., whose sales director is taking a prominent part in negotiations.

The Russians, for their part, appear to be favourably inclined, and have in the recent past placed substantial orders for British electrical equipment. Not least among these was a £500,000 cable contract secured by Crompton Parkinson Ltd. early in August. Not long afterwards the Brush Group won another large contract valued at about £3 million. Brush and Enfield Cables are understood to be participating in the visit.

The First Half-Century

A deputation from the Institution of Electrical Engineers paid an unwonted visit to Windsor Castle last week. Mr. Kaye Gray, president, presented the King of Italy with an address acknowledging with a lively sense of gratitude the extreme kindness with which the Institution pilgrims were treated during their Italian trip last Easter. I hope it will not be long before some of our leading electrical men have occasion to visit Windsor Castle on business. It is high time that a few baronetcies or knighthoods were forthcoming to show that British electrical science is not without honour in its own country. Since Sir William Thompson became Lord Kelvin the fountain of honour seems to have dried up as far as the electrical profession is concerned.—*From our issue of November* 26, 1903.

Collection of Unpaid Accounts

Southern Board Criticised for imposing Extra Charge

FORTHRIGHT criticism has been levelled at the Southern Electricity Board for its practice of making a charge for collecting outstanding accounts. The Board had found, apparently, that many consumers neglected to pay their accounts within the period allowed for payment, but settled the bill when the Board's representative called to disconnect the supply. It was feared that an extension of this practice would increase costs incurred in collecting accounts and consequently it was decided to make a charge. This practice was brought to the notice of the Consultative Council who queried the matter.

The Board defended their action by quoting Section 2 of the Electricity Act which gave them power "to do anything and enter into any transaction which in their opinion is calculated to facilitate the proper performance of their duties or the exercise or performance of any of their functions or is incidental thereto." It is this authority which has been criticised. Critics have pointed out that such a method could not be adopted by any other trader who might seek some extra money for going to collect it. Moreover, they assert, if the collector called with a gun in his hand, he could explain that it was "conducive to the exercise of his functions." In their reply, the Board go on to say it would be unfair to prejudice the majority of consumers who would have to bear the extra costs incurred in collecting accounts, because of the failure of some to pay in the ordinary way. The Consultative Council has accepted the Board's reply.

The Council has also decided not to recommend a resolution of the local National Chamber of Trade which sought a renewal of the system of allowing 2½% discount for prompt payment of bills.

Engineers' Strike

REJECTION of a claim for a 15% increase in wages resulted last week in the Confederation of Shipbuilding and Engineering Unions calling a 24-hour strike on December 2. It was recommended by the Confederation's president that all workers in factories and shipyards leave their places of employment for 24 hours on a date to be fixed. Action to be taken after December 2 is not yet known and there is no confirmation to suggestions of a ban on overtime or on a limitation of piecework. Such action may not be overpopular in view of the proximity of Christmas. The executive is to meet again on December 9.

Paper on Electricity in West Germany

JUST returned from her tour of Western Germany, is Miss Joan Sharp, senior demonstrator of the N.W. Board's Oldham sub-area, who holds the ninth Caroline Haslett Trust Travelling Exhibition. She will give a full account of her electrical experiences during the tour in a paper to be given at the I.E.E. on January 26. Among the places visited by Miss Sharp was Dormstadt where she was able to study experiments in demonstration technique in the new Selling Centre there.

NO SUPPORT FOR METER TOKENS

SUGGESTION that tokens should be purchased from electricity and gas service centres in the N.-Western Area for insertion in meters instead of coins, is not likely to be adopted. The proposal followed several cases in which electricity and gas meters had been broken into and the contents stolen. The Gas Board has rejected the idea stating it would be too costly and impracticable. It was calculated that about 60 million tokens would be needed for gas consumers. We understand that the Electricity Board is unlikely to adopt the suggestion.

Power Factor Conference

INDUSTRIALISTS in the eastern and central sub-areas of the S. Wales Electricity Board are attending a three-day Power Factor Conference in Cardiff organised by the Board. Its purpose is to explain the financial and technical advantages to be gained by the improvement of low power factor installations, and with this in mind invitations were sent to those with installations having a power factor below ·85. Today and tomorrow have been set aside for the industrialists, and apart from the small exhibition, Mr. W. A. Gallon, deputy chairman of the Board, will speak on the cause, effect, and improvement of power factor.

Comparative costs of running an Ekco Thermovent convection heater and an ordinary electric fire are shown in this window display in Cannon Street, London, by Mortimer Gall and Co., Ltd. 1 kW fire and convector heater were used and over a 24-hour period the saving in operating the latter appliance was proved

P.T. on Electrical Appliances Unfair

A REQUEST is to be made to the Midlands Electricity Board to find out why electrical appliances carry a greater rate of purchase tax than gas appliances. It was pointed out at last week's meeting of the area's Consultative Council that when the differentiation was made, electricity supplies were limited, but the situation had altered since then. A resolution asking the Board to make enquiries replaced an earlier motion that the Government be asked to remove entirely all purchase tax on domestic labour-saving electrical apparatus.

Another recommendation made at the same meeting was that the Council's title be changed to "Electricity Consumers' and Consultative Council." Several members felt that the main purpose of the Council, namely that it represented consumers, needed further emphasis.

New Institute for General Managers

ABOUT 100 chief executives were present at the inaugural dinner of the Institute of General Managers at the Savoy Hotel, London, last Friday. The formation of this new body arises from the frequent emphasis laid by Productivity Teams on the vital role played by top management in the States. It is an exclusive organisation. Requirements of managerial experience and training are essential, but also no candidate will be accepted who does not hold a bona fide general management appointment. One of its basic concerns will be the education and training of potential general managers.

OFFICIAL PUBLICATIONS

DEFENCE SPECIFICATIONS: 1060, Refrigerators for all Climates; 1061, Refrigerators for Temperate Climates from 3 to 25 cu. ft. H.M.S.O.

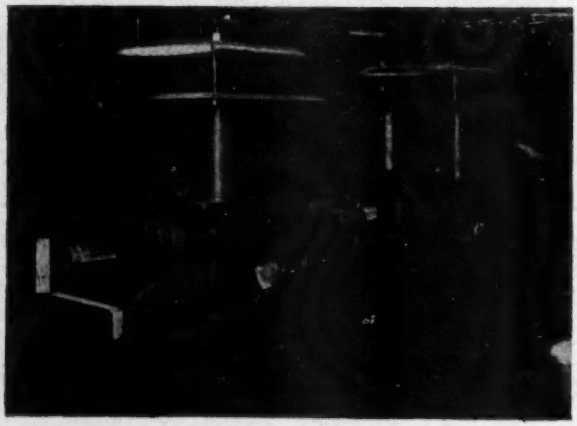
BRITISH STANDARD.
B.S. 2045: Preferred Numbers.

ELECTRICAL ENGINEERING FACULTY AT CORK

THE new electrical engineering department at Cork University is expected to be opened officially next October. The buildings are well forward and are situated in the University grounds. In addition, Prof. Teaque, formerly professor of electrical engineering at Liverpool, is supervising installation work, programmes and similar preliminary arrangements. This establishment will be a welcome addition to the educational facilities of Eire. Hitherto, students wishing to take a degree in electrical engineering have had to go to University College, Dublin.

Dismissed Apprentice fails in Damages Claim

JUDGMENT was given at Chippenham county court last week in a case involving a claim for £200 damages by an apprentice for a breach of an apprenticeship agreement and wrongful dismissal. Defendants were A. J. Warner Ltd., a local electrical contracting firm. Judge C. Kirkhouse Jenkins, Q.C., dismissed the claim with costs. He said the plaintiff had worked for the company for about 18 months before becoming indentured as an apprentice. It was contended there was a breach of the indenture in that the plaintiff had not been properly instructed, and was frequently working with an unqualified journeyman electrician who was also serving an apprenticeship. Defendants admitted that this was the case for a short period. The judge said he was satisfied that the claimant refused to carry out reasonable instructions. It was the practice to tell apprentices how to do a job and allow them to get on with it under supervision. Apprentices were not onlookers. He said the company had discharged their obligations and were extremely patient.



60 YEARS OLD MOTORS

AFTER an active life of about 60 years these two Holmes generators at the Hebburn works of A. Reyrolle and Co. Ltd. were withdrawn from service last month. Original design records no longer exist but it is believed they were made about 1890. The motors were in the power house at the Portland Road factory of J. H. Holmes and Co. but were moved with the works to Hebburn. Each machine was marked 110/136 V 400 A, 460 r.p.m. and 700 A maximum, but they were frequently overloaded far beyond the maximum.

Mechanical Engineers' New Publications

NEW arrangements concerning the issue of publications have been announced by the Institution of Mechanical Engineers, and are due to become operative in the New Year. A new monthly publication entitled *The Chartered Mechanical Engineer*, appearing ten times a year as before, will replace the monthly *Journal* and quarterly Proceedings A and papers of specialised interest (Proceedings B) will be replaced by *Institution Proceedings* and *Automobile Division Proceedings*. The main magazine is to remain much the same but will contain some additional matter previously included in Proceedings A. The supplementary publications may be supplied as published, or as two bound volumes for the year.

This 86,700 kVA generator stator, weighing 105 tons, is seen being transported for the Trafford Park works of Metropolitan-Vickers, to Battersea B power station where it arrived last weekend. The two-axis 100,000 kVA set, of which this stator will be part, is a duplicate of one the same company installed at Battersea in 1943

Christmas Lectures in 1953

. . . at the I.E.E.

THE popular Christmas lecture arranged by the I.E.E. for older schoolchildren is to take place on December 31 and on January 1. This is the eighth year of this event and hitherto the normally large audience has by no means been confined to schoolchildren. The organisers have asked, however, that parents do not accompany their children as accommodation is limited. Lecturer this Christmas is Dr. J. H. Mitchell, who has chosen to speak on "Electricity through Gases." Venue is the Institution's lecture theatre and the time 3 p.m. We understand that invitations have been sent to schools in the home counties but a number of tickets are being reserved for members' children. Applications should be submitted by December 3.

. . . of the L.C.C.

ONCE again also the L.C.C. has arranged its customary series of lectures for schoolchildren to be delivered at various centres in London between December 29 and January 4. There will be ten lectures in all, but unfortunately reference to electricity this year is of only an incidental nature. "Romance of Radar" is probably the most applicable, and this talk will be given by Mr. E. J. Doherty at Sir John Cass College at 2.30 p.m. on December 30. "In a twinkling of an Eye," a talk by Mr. R. F. Saxe on phenomena which cannot be discerned by the eye, is almost certain to contain a reference to our industry. This will be at Queen Mary College, E. 1, at 10.30 a.m. on January 1. The lecture by Sir E. Graham Savage on "Colour" at Wandsworth Technical College on the same day (2.30 p.m.) contains reference to lighting.

. . . at Royal Institution

"THE Uses of Radio Waves" is the subject chosen for the 124th course of Christmas lectures arranged by the Royal Institution. The talks are specially adapted for juvenile audiences and will be given this year by J. A. Ratcliffe. The first lecture will be on December 29, and the remainder on December 31, January 2, 5, 7 and 9, at 3 p.m. in each case. Subscription for non-members is £2 and for children (10-17) £1.

A Good Year for Radio and TV Sales?

THIS year is almost certain to prove one of the best as regards sales of radio and television sets. The latest figures issued by R.T.R.A. for September show increases in both cases and now that the summer months are over, during which time sales were kept at a higher rate than usual, all is set for the usual winter buying. TV sales during September almost doubled those of August, and were the highest recorded for that month. Average number of TV sets sold per shop in the month under review was 12·12 compared with 6·19 in August and 10·28 in September 1952. Similar figures for radio sales were 8·41 in September, 6·85 in the same month last year and 7·1 in August.

Don't Fear Atom Age

IN a message to the Engineers' Guild, the president, Mr. H. Nimmo, chairman of the Southern Electricity Board, had a memorable word to say about the future. He told engineers not to fear the chances and changes of the atomic age. It would take man a long time to adapt himself and his institutions to the great new source of power, he said. As he did so, however, his need would grow for those qualities of resolute integrity, dispassionate judgement and humane organising ability which chartered engineers strove to promote in themselves.

T.U.C. Inquiry into Consultative Councils?

CRITICISM of Consultative Councils is not a new departure, but recently a member of a Council added his name to the critics in describing his own body as a "rubber stamp" of the Board. Delegates at a meeting of the Midland Regional Advisory Committee last week called for a detailed investigation into the workings of the Councils on the grounds that they were not doing their proper job. The T.U.C. General Council is to be asked to convene a meeting of union representatives to ascertain if the Councils serve a useful purpose.

There were many accusations raised. It was stated that the Councils discussed trivialities; and that they merely sanctioned decisions of the Board. Allegation was made that the price movement on electricity was going from the domestic to the industrial consumer and that members of tariff sub-committees were industrialists who would have nothing of the increases. Why, it was asked, were officials not appointed by the Councils? One member said the Council was ineffective because it was structurally impossible for it to be effective.

An illuminated display produced by the British-Thomson-Houston Co. with the familiar slogan picked out in light. Effect of neon sign writing has been achieved by light behind the display passing through coloured translucent plastic borders and letters. The display may be stood on the counter or hung

Charity Socials

TWO functions are being organised by Mr. H. S. Walton of Smith and Walton Ltd, to help gather funds for the Royal Commercial Travellers' Schools. They will take place at Carlisle on January 21 and at Cardiff on December 8. The latter is a dinner and dance at the Royal Hotel and tickets are 25s. Tickets for dinner and carnival ball at the Crown and Mitre Hotel, Carlisle, will be 30s.

Factory Fire

WE heard with regret of damage sustained at the Manchester works of Ferguson Pailin Ltd. last week due to fire. Fire broke out in the woodworking department on the night of November 18. Fortunately the building concerned was detached from the main works and the blaze was confined, so that little dislocation of production is anticipated. The company has asked us to express on their behalf appreciation of the many offers of assistance which have been received.

Wartime Invention gains £20,000 Award

IT was announced last week that the Government has made an award of £20,000 to Pye Ltd. for development work during the war in producing the radio-operated fuse and the No. 19 communication set for tanks. The fuse was successfully tried in 1941, but because of the bombing it was necessary to fly engineers and full details to the U.S. where final trials were carried out, and may have been the reason why America received the credit for the invention. The No. 19 set was used extensively in all allied tanks. The award is to be given to the men responsible, but the success of the invention depended on every employee, so it has been decided to match the £20,000 with a similar sum to the employees' benevolent fund.

Schools are Biggest Recruitment Bottleneck

SCHOOLS present the most difficult problem where recruitment of professional engineers is concerned, said Lord Simon of Wythenshawe, speaking at a meeting of the Court of Governors of Manchester University last week. Last year 200 places available in universities and colleges for engineering students were not filled for lack of suitable applicants. This was partly attributable to lack of science masters, but another important factor was that heads of grammar schools were not as a whole convinced yet that engineering was an important field for their boys. Yet twice the number of engineering graduates at present being turned out could readily be absorbed in British industry.

NEWS IN BRIEF

We hear there are still some tickets left for the A.S.E.E.'s first post-war Ladies' Night to be held on December 5. They are available from the secretary, Mr. E. A. Bromfield at 54 Station Road, New Barnet, Herts.

Lighting of the interior of Westminster Abbey for the Coronation ceremony last June, plus some historical notes, is the subject of an illustrated commemorative booklet produced by Holophane Ltd.

A dollar contract valued at £1 million has been placed with Stewarts and Lloyds Ltd. by the American contractors, Williams Bros.

Ideal Home Exhibition is to revert to pre-war hours of opening next year, namely from 10 a.m. to 10 p.m.

Yorkshire Board's 74th service centre was officially opened in Station Rd., Ossett, by the Mayor, Cdr. H. Smith.

Selling price of tungsten ores of standard 65% grade have again been reduced. Wolframite is now 210s. and Scheelite 195s. per long ton delivered consumers' works.

Questions in Parliament . . .

E.D.A. Pamphlet

The Fuel Minister made a short statement on Monday concerning the E.D.A.'s pamphlet "Facts about Fuels" in reply to Mr. G. Nabarro who asked if inquiries had been completed. He said the pamphlet was open to criticism because it made certain misleading comparisons between fuels. He said he had told the B.E.A. of this. The Minister added that he could not restrain promotional activities, but had received an assurance that the particular mistake would not be repeated.

Fuel Efficiency Company

Asked by Mr. Palmer on Monday concerning the futures of members of the Ministry's Fuel Advisory Service, the Minister of Fuel and Power said it was hoped that most of the staff would be offered appointments with the new Fuel Advisory Company. Those who applied and were not accepted would be considered for posts in other Government Departments, he added.

Pedestrian Crossings

A number of questions were asked last week concerning the advisability and extension of flashing beacons. Mr. Molson replied. He said the present system of illumination was considered best and no objections had been raised by motoring organisations or local authorities. He rejected the suggestion that lights should be steady instead of flashing, and went on to say that the Ministry now felt it was unwise to synchronise lights which were close together. As a result of experience gained the original idea for synchronisation had been abandoned. Replying to a critic of the beacons, Mr. Molson said the scheme was an experiment to try and make roads safer; if anything better was suggested, it would certainly be investigated and considered.

Development in Wales

The Minister of Fuel and Power assured Mr. Gower that future electrical development in Wales would be on a scale comparable with other parts of the U.K. Mr. Gower then said that progress in rural electrification in Wales was slower than in other areas, and asked if a better performance could be expected in future. The Minister said the B.E.A. had improved the main transmission lines which was already providing a better performance.

Air Pollution Report

Interim report of the Air Pollution Committee was expected to be submitted to the Minister of Housing shortly, Mr. Marples stated in a written answer last week. Asked if local authorities could be allowed to establish smokeless zones without expense and delay of promoting Private Bills, Mr. Marples stated the advice of the Committee would be sought before taking any action of that nature.

Supplies to Western Isles

Mr. M. MacMillan sought information last week concerning the methods adopted by the N. of Scotland Board to supply new consumers in the Western Isles. He called attention to the arrangement to carry out schemes with profits made by the larger economic schemes. He referred also to the selection of some isolated hamlets and the endeavour to balance increasing costs and losses by imposing special terms on a small number of crofters. Mr. MacMillan asked if "this rather niggardly imposition" could be abandoned. He was told that the cases mentioned involved supplies from diesel engines which was far more expensive than other methods.

Minimising Apparatus

In the effort to achieve increased smoke abatement, had the possibilities of making available reasonably priced smoke consuming or minimising apparatus for domestic chimneys been explored, asked Mr. Sorensen. Mr. Marples said he would be pleased to have particulars of the kind of apparatus suggested.

Hire Purchase

In a written answer, the President of the Board of Trade stated the need of the Hire Purchase and Credit Sale Agreements (Control) Order was being watched closely but there was no intention at present of either amending or rescinding it.

B.S.I. Funds

Tribute to the valuable work of the British Standards Institution was paid by Miss Burton, who suggested the work done would be much better publicised if a little more money was made available for the purpose. She proposed that a larger grant be made. Mr. P. Thorneycroft said future grant-in-aid was being considered and the review would cover the question of publicity at the same time.

Purchase Tax Changes

Several more questions were asked last week concerning the advancement of announcements regarding purchase tax changes. Mr. Boyd-Carpenter refused to be drawn further, however, despite an appeal that time was getting short and an early decision would be a vital help. He said the urgency was appreciated and importance of the matter not underrated.

Gileston Power Station

In a written answer on Friday, Mr. Geoffrey Lloyd said he had received no application concerning the erection of a power station at The Leys, Gileston, in Glamorgan.

Company Activities . . .

Barton and Sons Ltd.

This concern of conduit manufacturers has received the consent of the Capital Issues Committee to the issue of 975,000 Ordinary 5s. shares at 9s. 3d. each, in the proportion of one for every two 5s. Ordinary stock units held. The directors have agreed to forgo the rights attaching to their own holdings to the extent that this is necessary to enable the one-for-two offer to be made to all other shareholders. The directors intend to pay a final dividend of 10% on the increased capital, but the new shareholders will not be entitled to the interim dividend payable on December 1. The additional capital is being raised to offset in part the substantial sums expended on fixed assets out of profits since the Preference share issue in 1947 and to augment the cash position to take care of the increase in stock and work in progress.

Frederick Braby and Co. Ltd.

There was a substantial reduction in profits for the year ended September 30 last. The trading balance amounts to £463,643, compared with £705,050 for the previous period, but with a final dividend of 12½%, the total distribution for the year remains 15%.

Brook Motors Ltd.

The group profit for the year ended September 30 last is £401,844—a decrease of £281,106 compared with the previous year. After providing for U.K. taxation, etc., the net profit is £107,495, as against £243,491 for the preceding period. The total distribution for the year is again 20%, but the final dividend of 15% is payable on the Ordinary as increased last August.

Crompton Parkinson Ltd.

Although the earlier decline in demand continued, this group's productivity increased, resulting in a higher trading profit, but the pool of orders in hand has been considerably reduced during the financial year ended June 30 last. There has also been an improvement in the cash position of well over £2½ million; a result made possible by reduction of stock-in-trade and work in progress of just over £1½ million. But the net indebtedness to bankers and others still remains at nearly £750,000. Mr. Albert Parkinson, the chairman, also refers to the difficulties associated with overseas trade. In the latter months of the year under review there was a welcome and favourable turn of the tide, but it would be wrong to deduce that all was set fair for the future—economic stability has not been achieved in any of the important overseas markets, and its achievement was not infrequently retarded by political considerations, he adds. Turning to control of the company, he states that as the result of voting power being extended to all equity shareholders there are now no concentrations of voting power likely to form the nucleus of voting control.

Year to June30	£ Trading Profit	£ Net Profit*	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	1,627,362	501,836	37	22½	28/9	21/6
1950	1,799,620	552,725	21	11½†	12/7	11/1
1951	1,837,431	348,082	20	11½	13/1	9/6
1952	2,045,242	378,495	22	11½‡	9/9	7/3
1953	2,419,861	643,067	36	20	12/11	8/7

* Attributable to the company.
† Plus 100% capital bonus.
‡ Plus 12½% capital bonus.

Electric and Musical Industries Ltd.

The fluctuating fortunes of this concern over the past five years are clearly reflected in our accompanying table. Sir Alexander Aikman, the chairman, points out that in regard to the year ended June 30 last, although there was a substantial decrease in the trading profit compared with the previous year, sales in the U.K. showed an increase, but the profit margins were considerably reduced as the result of lower selling prices and higher costs. The effect of lower selling prices has been offset by the transfer from the stock prices fluctuation reserve of £220,000. The group's total investment in foreign subsidiaries amounts to £2,066,621. These subsidiaries made a net profit of £359,002 for the year, compared with £450,805 in the previous twelve months.

Year to June 30	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	1,040,418	318,497	20	8	22/4	14/9
1950	916,238	268,802	16	8	28/6	16/4
1951	1,994,507	663,000	43	12	25/1	17/9
1952	1,626,377	402,365	20	12	18/11	12/6
1953	814,039	279,983	—	8	15/3	12/6

Enfield Cables Ltd.

The news that there is to be no interim Ordinary dividend in respect of the year ending December 31 next, is obviously not pleasing to the shareholders. But the directors have agreed on this, considering it more prudent to await the results for the full year before deciding dividend policy. The cable business has been difficult by reason of the falling off in orders and reductions in profit margins, as were earlier anticipated. At the same time there has been little reduction in the rate of loss at Brynmawr Rubber Ltd. in spite of an improvement in output and quality of the goods produced. The Brynmawr loss may absorb the greater part of the profit in the cable business for the year ending December 31 next.

Stream-Line Filters Ltd.

For the year ended December 31 last, the group trading profit is £283,316, which is £106,921 more than for the previous year. After

deduction of depreciation and taxation the balance is £77,989 (*£63,443*). There is a 5% bonus, making a total of 25% for the year, as against 20% for the previous period.

Taylor Tunnicliff (Electrical Industries) Ltd.

In announcing the offer of 1,200,000 new Ordinary 5s. shares, being issued on a one-for-one basis, the board points out that the dividend policy remains unchanged and the step has no necessary relation to amounts which the Board may in future recommend should be distributed by way of dividend. Whilst reserves available in the group as a whole are more than adequate for the purpose, those appearing in the last balance sheet of the holding company are relatively small. The necessary reserves have been made available by the issue in the first instance of bonus shares to the holding company by subsidiaries aggregating in value £305,000.

Dividends Declared

Electric Furnace Co.—Interim of 3½% *(5½%)* but on doubled capital.

General Cable Manufacturing Co.—Final dividend of 18% making a total of 30% *(both same)*.

Johnson and Phillips Ltd.—Interim of 7½% *(same)* but on increased capital.

Electric Supply News . . .

Eire

In our report of the inquiry into the River Bann hydro-electric scheme given in November 12 issue, reference was made to evidence given by Mr. Geoffrey Kennedy. He now asks us to make it clear that he said the scheme would save Northern Ireland about 25,000 tons of coal in an average year, at a cost at present day prices of about £87,500.

Belfast

In regard to plant for the new power station West, the town clerk has now informed the city electrical engineer and general manager, Mr. R. P. Watson, that under the present regulations the Corporation had no option but to allow foreign firms to tender for the supply of plant. On August 10 the Electricity Committee decided not to consider tenders from Messrs. C. Wykeham and Co., asking if they would be considered if they submitted tenders for a turbo-alternator of West German manufacture, or alternatively of partly German and partly British manufacture. The city electrical engineer has informed the Committee that their consultants have received a letter from that firm dealing with a tender for a 150 ton electrically driven crane of German manufacture, and also a letter from the France-Ireland Trading Co. requesting details of specifications for new power station plant. With the approval of the Committee Mr. Watson has drawn the attention of the consultants to the clause in the supplemental conditions of the contract in respect of equipment not of British manufacture and relating to preference for Commonwealth countries.

Gloucestershire

The public inquiry into the B.E.A.'s proposal to erect 275 kV grid lines across the Cotswold Hills has been postponed from December 2 until late January or early February, the Minister of Fuel and Power has stated. Then the inquiry will consider objections from any local authorities or private parties affected throughout the length of this section of the super grid which is to run from Hams Hall power station, Coleshill, to Melksham, Wiltshire.

Leeds

The 6.6 kV distribution in the city is to be substantially reinforced by the Yorkshire Electricity Board. At the same time the Board is to co-ordinate operation of the h.v. distribution systems by the installation of a number of system-control centres at strategic points in the area. Two new substations will be built in North Leeds—at West Park and Fir Tree Lane—and will be fed from Kirkstall Power Station. Two more will be established at Church Street and Holbeck. New control centres will be located at main grid supply substations, and the first of these has been installed at Low Road to cater for the operation of systems supplied from Kirkstall, Whitehall Road and Ferrybridge power stations and Low Road transforming station.

Stone

When the matter of alleged excessive grit emission from Meaford 'A' power station was raised at a recent meeting of Stone Rural Council, the Medical Officer was instructed to seek a full assurance from the B.E.A. that in the 'B' station now under construction a new type of apparatus would be incorporated, and also on the question as to what action was proposed to remedy any defects in the existing plant.

LIGHTING SCHEMES

Croydon.—The current year's estimates include £3,500 for the erection of new street lighting standards. Application is to be made to borrow that sum.

Felling (Co. Durham).—The U.D.C. surveyor, Mr. H. Fawcett, has been instructed to prepare a scheme for new lighting on the trunk road.

Newhaven.—The council is recommended to instruct the surveyor to prepare a scheme for improved lighting in High Street, Bridge Street, Railway Approach and The Drove.

Commercial Information

CONTRACTS OPEN

HOME

Dates given are the final for receipt of tenders, unless otherwise stated.

27 Nov.—Farnham U.D.C. Lighting pedestrian crossings.—See Nov. 12 issue.

27 Nov.—Gosforth U.D.C. Street lighting.—See Nov. 19 issue.

27 Nov.—Merthyr and Aberdare. Rewiring at Merthyr General Hospital.—See Nov. 19 issue.

27 Nov.—N. Ireland. Installation at Whiteabbey Hospital, Antrim.—See Nov. 5 issue.

27 Nov.—Paignton U.D.C. Sewage pumps, control panel, etc.—See Nov. 19 issue.

28 Nov.—Dundee T.C. Supply of electric lamps to various departments and institutions during 1954. Town Clerk, City Chambers.

30 Nov.—Bournemouth T.C. Equipment for sub stations.—Advertised in Nov. 5 issue.

30 Nov.—Dover T.C. Two street lighting contracts.—Both advertised in Nov. 12 issue.

30 Nov.—Dundee T.C. Street lighting.—See Nov. 19 issue.

30 Nov.—Lanarkshire. Electrical installation in new Protestant and R.C. primary schools at Orbison, Bellshill. Applications by above date to W. C. Brownlie, county clerk, Lanarkshire Hse., 191 Ingram St., Glasgow.

30 Nov.—Manchester T.C. Alterations to electrical installation at Walton House, Ancoats. City Architect, Town Hall. Deposit £1 1s.

30 Nov.—N. Ireland. Installation of fire alarm system at Throne Hospital, Belfast. Purchasing Officer, Royal Victoria Hospital, Belfast.

30 Nov.—N. Ireland. Installation in 183 houses at Omagh, Dromore, and Killyleagh.—See Nov. 19 issue.

30 Nov.—St. Helens T.C. Street lighting.—Advertised in Nov. 12 issue.

30 Nov.—Tottenham B.C. Supply of lamps during 1954-55.—See Oct. 15 issue.

1 Dec.—Hull. Supply of electric lamps and cables for hospitals.—See Nov. 19 issue.

1 Dec.—Luton T.C. Alterations to lighting installation at Hitchin Rd. junior and infants' school. Borough Engineer, Town Hall. Deposit £2 2s.

1 Dec.—N. Ireland. Installation in 50 dwellings at Donaghadee. See Nov. 19 issue.

1 Dec.—Torpoint U.D.C. Repair, maintenance, etc., of installations and equipment in council houses.—See Nov. 19 issue.

2 Dec.—Newcastle-on-Tyne T.C. Installation in 216 dwellings on Kenton North estate.—See Nov. 19 issue.

3 Dec.—Co. Down. Installation at Castlewellan intermediate school.—See Nov. 12 issue.

4 Dec.—Belfast T.C. Crane, switchgear, etc.—Advertised in Oct. 15 issue.

4 Dec.—Deben (Suff.) R.D.C. Pumping plant.—See Nov. 12 issue.

4 Dec.—Romford T.C. Installations in 134 dwellings on Heaton Grange site.—See Nov. 19 issue.

5 Dec.—Longbenton U.D.C. Installation in 22 houses on Kelvin Park estate.—See Nov. 12 issue.

7 Dec.—Aberdeen T.C. Installation in offices, workshops, etc., at Cattofield Place.—See Nov. 12 issue.

7 Dec.—Belfast. Electrical installation in laboratories at Methodist College. J. R. W. Murland, Consulting Engineers, 13 Wellington Place. Deposit £3 3s.

7 Dec.—Birmingham T.C. Installation of electric lift in block of shops and flats at Digbeth. H. J. Manzoni, City Engineer and Surveyor, Civic Centre. Deposit £2 2s.

7 Dec.—Garstang (Lancs.) R.D.C. Erection of 259 street lighting columns, and fitting and wiring of mercury-vapour discharge lanterns and ancillary equipment. T. R. Ellis, Engineer and Surveyor, Council Offices. Deposit £2 2s.

7 Dec.—Newport (Salop) U.D.C. Street lighting.—See Nov. 19 issue.

7 Dec.—Salford T.C. Call system in 4 bathing establishments.—Advertised in Nov. 12 issue.

7 Dec.—Scunthorpe T.C. Street lighting.—Advertised in Nov. 19 issue.

7 Dec.—Swansea T.C. Electrical installation in 129 houses on West Cross estate. Applications by above date to Borough Architect, The Guildhall. Deposit £2.—Advertised in this issue.

8 Dec.—Dublin T.C. Supply of power factor correction equipment for four three-phase star delta induction motors driving centrifugal pumps. Also supply of 500 traffic bollard direction indicators. Separate contracts. Finance Dept., City Hall.

8 Dec.—Oldbury T.C. Supply and erection of 212 25-ft concrete columns, time switches, H.P.M.V. discharge lamps, and fixing only of lanterns and auxiliaries. Borough Surveyor, Municipal Bank Chambers. Deposit £2 2s.

8 Dec.—Peterhead T.C. Electrical installation in four blocks of three-storey flats on Catto Drive site. Burgh Architect, R. D. Cruickshank, 60 Broad Street.

8 Dec.—Sedgley U.D.C. Street lighting.—See Nov. 19 issue.

9 Dec.—Southport T.C. Installation of electric lighting and heating in houses in Heathfield Rd. estate. Borough Architect and Town Planning Officers' Dept., 93-105 Lord St., Deposit £1 1s.

11 Dec.—Belfast T.C. Boiler units for Power Station West.—Advertised in Oct. 1 issue.

11 Dec.—Belfast T.C. Exhaust piping with valves and electrical controls for Power Station West.—Advertised in Oct. 15 issue.

11 Dec.—Sheffield T.C. Electrical installation in 214 dwellings in scheme 2 and 477 dwellings in scheme 3 on Greenhill estate. J. L. Womesley, City Architect, Town Hall. Deposit £2.

12 Dec.—Newmarket U.D.C. Street lighting.—See Nov. 19 issue.

12 Dec.—Port Talbot T.C. Installation in 810 houses at Cwmavon and Baglan.—Advertised in Nov. 19 issue.

14 Dec.—Barnsley T.C. Street lighting.—Advertised in Nov. 19 issue.

16 Dec. — Newcastle - on - Tyne T.C. Installation in 21 flats.—See Nov. 19 issue.

16 Dec. — Newcastle - on - Tyne T.C. Lighting in 965 houses.—See Nov. 19 issue.

16 Dec.—Norwich T.C. Supply of equipment for illumination of 18 pedestrian crossings. City Engineer, City Hall. Deposit £1 1s.—Advertised in this issue.

18 Dec.—Belfast T.C. Turbo-alternators, feed heating and condensing plants sets, generator transformers, and circulating water pumps for Power Station West.—Advertised in Oct. 15 issue.

18 Dec.—Belfast T.C. 110 kV oil pressure or gas type, and 33 kV main cables, auxiliary cables and accessories.—Advertised in Nov. 5 issue.

18 Dec.—Windsor T.C. Installation in 36 flats in Dedworth Rd.—See Nov. 12 issue.

28 Dec.—Fifeshire. Electrical work in extension to Auchterderran South school. Apply to James Gentles and Son, Chartered Quantity Surveyors, Central Chambers, High St., Kirkcaldy.

4 Jan.—Lancaster T.C. Pumping plants for Lune St., Scale Hall, and Willow Lane pumping stations.—See Nov. 5 issue.

No date stated.—Banchory T.C. Supply and erection of complete street lighting scheme in High St. and Dee St. A. H. Steele, Burgh Surveyor, Burgh Bldgs.

No date stated—Southampton T.C. Supply and erection of electrically-driven pumping plant with a.c. motors and other equipment for Timsbury pumping station. H. Hawksley, Waterworks Engineer, Civic Centre. Deposit £5.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Road, W.C.1, quoting reference.*

17 Dec.—South Africa. Supply to S. African Air Force 240 spreader-type corrugated heat-resisting glass insulators, 48 strip holders for 250 V filament lamps, and a rectifier for electroplating. Union Tender and Supplies Board, 271 Visagie St., P.O. Box 371, Pretoria. B.o.T. (Ref.: ESB 9685/53).*

9 Jan.—Iraq. Supply and installation of runway, taxi-way and approach lighting, obstruction lights, landing direction indicators, etc., main feeder and control cables, switchgear, control equipment and desk, transformers, and diesel generating set for Bagdad West airport. Contract No. A/2(1953). Govt. of Iraq, Ministry of Development, Bagdad. B.o.T. (Ref.: ESB 9328/53).*

21 Jan.—New Zealand. Stores Div., G.P.O., Wellington, invite tenders (No. 150/6552) for supply of 15 portable-type ammeters for ranges 0-10 and 0-15 a.c. amp; 40 moving-coil d.c. single-range, flush-mounting voltmeters; and one conductivity meter, 0-30 microhms for 230 V 50 c/s a.c. supply. B.o.T. (Ref.: ESB 9091/53).*

29 Jan.—Australia. Tenders (E.28/53) invited for supply and erection of 33 kV paper insulated cables and sealing boxes and 3·3 kV paper insulated cables; also supply of 660 V power cable and multi-core control cable with accessories. Documents from Chief Engineer and Manager, Dept. of Electricity, Kelvin House, Adelaide St., Brisbane, at 10s. 6d. a copy.

2 Feb.—Brazil. Planning, supply and erection of 69 kV transmission lines between Sao Jeromino power station and Venancio Aires—about 60 kilometers. H-type wooden poles specified. Comissae Estadual de Energia Electrica. B.o.T. (Ref.: 9266/53).*

8 Feb.—New Zealand. Supply of three boilers, each with guaranteed max. cont. rating of 7,000 lb steam per hour. Cook Hospital Board, Gisborne. B.o.T. (Ref. ESB 9178/53).*

CONTRACTS PLACED

Altrincham T.C. Provision of street lighting in Stockport Rd., General Electric Co. Ltd., £3,815.

Bexley T.C. Electrical installation in houses on Halcot No. 3 estate, Norwood Electrical Co., Ltd. £12,206.

Middlesbrough. Electrical installation at Broken Scar pumping station for Tees Valley Water Board, Doves Ltd., £4,398.

Sunderland T.C. Wiring of 263 houses on Marley Pots estate, J. Calvert, £5,955.

Your Queries — Answered

"B.D.L." fusegear, etc., makers of? B.W.—These, with a range of domestic appliances, were produced by the British Diamix Ltd., a firm which went out of business about five years ago. There are no manufacturer's spares available. (24763)

"New-Mode" vacuum cleaners, address for spares? E.B.—Try: Hotpoint Electric Appliance Co., Ltd., Crown House, Aldwych, W.C.2. (24776)

Leather bevelling or creasing device, makers of? M.E.—British United Supply and Machinery Co., 462 Bethnal Green Rd., E.2; Chas Threfall, Blairmore, Argyllshire. (24785)

"Transtar" fluorescent control units, makers of? L.E.—Inductive Appliances, Ltd., 18 Dean St., Newcastle-on-Tyne. (24798)

"Norvic" blankets, makers of? G.G.—Denhams Electrical Ltd., Woodhouse Rd., Todmorden, Lancs. (24805)

"Glovac" fluorescent starters, makers of? G.C.—Manifold Electric Co., Ltd., 124 St. Margaret's Rd., Twickenham. (24819)

"Columbine" vacuum cleaner, makers of? C.S.—C.V.A. Jigs, Moulds and Tools, Ltd., Portland Rd., Hove 3. (24834)

The above are selected from questions we have answered this week. If you have a query, send it to us.

ANSWER WANTED

Firms prepared to produce amplifiers for the competitive market, for a tape recorder, address of? W.L. (24852)

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London, W.C.2.

W. M. Allan Ltd., Burnside Works, High St. West, Glossop. To take over business of insulation contractor and refrigerating engineer carried on at Glossop by Wm. M. Allan. Cap.: £1,000. Dirs.: W. M. Allan and Mrs. N. Allan.

A. H. Baker and Co., Ltd., 69 Grenfell Av., Hornchurch, Essex. Electrical engineers and contractors, wireless and television engineers, etc. Cap.: £100. Dirs.: A. H. Baker, Mrs. F. A. Baker and W. A. Fenwick.

Cozylux Ltd., 34 Chelmsford Rd., Shenfield, Essex. Electrical engineers and contractors, manufacturers of electrical apparatus, etc. Cap.: £100. Dirs.: Mrs. I. R. Ager, C. F. Ager and E. A. Horsnell.

Goblin Electric Appliances Ltd., Goblin Works, Leatherhead, Surrey. Cap.: £10,000. Dirs.: J. J. Hambidge and M. Johnston.

D. A. Grimmer Ltd., The Strand, Caldicot, Mon. Electrical engineers and general electric installation contractors, wireless and television engineers, etc. Cap.: £1,000. Dirs.: D. A. Grimmer and Joyce Grimmer.

High Voltage Servicing Co. Ltd., Langston Rd., Debden Estate, Loughton, Essex. Manufacturers, servicers and maintainers of high voltage generators, etc. Cap.: £1,100. Dirs.: A. E. Knight, T. B. Fox and L. A. Clements.

D. O. and E. Industries Ltd., 63 Ship St., Brighton. General, mechanical, electrical, wireless and maintenance engineers, etc. Cap.: £12,000. Dirs.: R. A. Durrant, W. H. Oborn and D. Eccles.

Jakens of Rottingdean Ltd., 94 Church Rd., Hove, Sussex. Manufacturers of and dealers in electrical and mechanical apparatus and accessories, wireless sets, valves, etc. Cap.: £2,000. Dirs.: to be appointed by subs. Subs.: A. G. Jakens and Mrs. F. B. Jakens, 36 High St., Seaford, Sussex.

Kencross Radio Ltd., 191 Kennington Lane, S.E.11. To take over bus. of electronic engineer carried on at Kennington Lane, S.E., as Kencross Radio by James T. Wright. Cap.: £1,000. Dir.: J. T. Wright.

PRICE OF CABLE METALS AND OTHER MATERIALS

(Official prices at Tuesday, Nov. 24)

	£ per ton	Weekly change
COPPER, standard class A (settlement)	238½	+½
,, (3 months)	228	13½
LEAD, refined pig, min. 99·97% purity (cash)	95	+1½
,, (3 months)	91	+½
TIN, refined, min. 99·75% purity (settlement)	665	+35
,, (3 months)	650	+30
ALUMINIUM, ingots 99·99·5%	150 0 0	—
ZINC, virgin, min. 98% purity (cash) ...	75½	−¼
,, (3 months)	75¾	+¼
RUBBER No. 1, RSS. spot ...(per lb.)	17⅝d.	+⅛
,, c.i.f. basis, ports. Feb. (per lb.)	17⅝d.	+⅛
ARMOURING:		
Galv. Steel Wire (0·104 in.)	50 10 0	—
Mild Steel Tape (0·014 in.)	40 0 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

D. Airley and Co., Ltd. Resolution for winding-up passed at meeting on Nov. 12, when P. H. Owen, Stafford Chambers, 14 Brown St., Manchester, was appointed liquidator.

Avery Ward and Co., Ltd. Members have appointed L. W. Loryman, Rex House, 38 King William St., E.C.4, as liquidator, and creditors are asked to send particulars to him by Dec. 16.

Berec Battery Export Co., Ltd., General meeting to be held at offices of Ever Ready Co. (Gt. Britain), Ltd., Hercules Place, Holloway, N.7, on Dec. 22, at 12 noon, to receive liquidator's report.

General Automatic Iron Ltd. Meetings of creditors and contributories being held today (Thurs.) at Inveresk House, 346 Strand, W.C.2, at 11.30 a.m. and 12 noon.

Panrek Magnetic Instruments, Ltd. V. W. Trow, F.C.A., of 59 Sloane St., S.W.1, has been appointed liquidator by creditors.

Princess Silk Shade Co., Ltd. General meeting to be held at offices of Poppleton and Appleby, 31 Lloyd St., Manchester, on Dec. 31, at 12 noon, to receive liquidator's report.

Vickers and Bowker (Holcombe Brook) Ltd. Ronald F. Bendall, 31 Lloyd St., Manchester, has been appointed liquidator by shareholders and creditors.

BANKRUPTCY ACTS

Receiving Orders

Bolton. Herbert S. Page, electrical retailer trading at 109 Market St., Westhoughton. Date of receiving order, Nov. 9.

Dudley. John Jevons, electrical engineer trading as R.E.C. Stores at 187 Wolverhampton St., Dudley. Date of receiving order, Nov. 14.

Tunbridge Wells. J. L. R. Mack, electrical engineer of 5 Priory Rd., Tonbridge. Receiving order dated Nov. 13.

Release of Trustee

London. Frederick Phillips, electrical contractor trading as F. Phillips and Son at 28 Blenheim Ter., N.W.8. Trustee was F. H. Langmaid, Official Receiver, Bankruptcy Bldgs., Carey St., W.C.2.

Order on Application for Discharge

Stoke-on-Trent. William H. Collis, electrical engineer trading at 59 King St., Fenton. Order dated Oct. 22. Discharge suspended for 6 weeks and takes effect from Dec. 4.

Intended Dividends

Leeds. Leonard Peel, electrical engineer of 216 Low Lane, Horsforth. Last day for receiving proofs, Dec. 5. Trustee is W. H. Meredith, Official Receiver, 29 East Parade, Leeds.

Wolverhampton. Joseph H. Bourne, electrical fittings manufacturer, trading as E. Desborough and Sons at Rayleigh Works, Powlett St., Wolverhampton. Last day for receiving proofs, Dec. 5. Trustee is R. K. Clark, Official Receiver, Somerset House, Temple St., Birmingham.

Dividends

Manchester. Frank L. Napier, electrical contractor, trading at 5 School Rd., Sale. First and final dividends of 6s. 2d. in £ payable today (Thurs.) at 47 Mosley St., Manchester.

BUSINESS PROSPECTS

HOME

Altrincham T.C. Construction of 112 houses on Broomwood estate. Borough Surveyor, Town Hall.

Ashington U.D.C. It is proposed to build 75 houses next year.

Bath T.C. It is suggested that 52 houses be erected between Sham Castle Lane and Bathwick Hill.

Bebington (Ches.) T.C. Architects to be asked to design first stage of new town hall, estimated cost of which is £56,000.

Bedfordshire. Primary school to be built at Ampthill.

Belfast T.C. Erection of 160 dwellings at Andersonstown. N. Ireland Housing Trust, 12 Hope St.

Birmingham T.C. It is proposed to build fire station and houses at Sheldon. Estimated cost, £70,875.

Bishop Auckland U.D.C. Permission received to sell land on Woodhouse Close estate for proposed R.C. church and presbytery. Council expected to build 220 houses next year.

Bradford T.C. Warehouse at conditioning house to be rewired and fluorescent lighting installed at estimated cost of £4,500.

Bridgnorth (Salop) T.C. Tenders likely to be invited soon for installation of electric lighting in town hall.

Burnley T.C. Erection of total of 92 houses on Far Brunshaw estate. Borough Engineer, 22-24 Nicholas St.

Castle Ward (Northumb.) R.D.C. 146 houses to be built at Brunswick Village.

Corby (Northants). Junior school to be built near Rowlett Road.

Cowes (I.o.W.) T.C. Shops and flats to be erected on Beatrice Ave. site.

Dagenham T.C. Erection of 108 flats on Marks Gate estate. Borough Engineer and Surveyor, Civic Centre.

Dorchester T.C. Tenders to be invited shortly for erection of 40 houses on Poundbury site. Total of 142 houses to be built on this site.

Gateshead T.C. Arthur and Kirkup of 13 Swinburne St. are architects for factory alterations for Havmor Ltd. Factory alterations also proposed by Sigmund Pumps Ltd.

Grangemouth. Dean of Guild Court has approved erection of factory for J. Wight and Co. (Edinburgh), Ltd.; and workshops and offices in Clyde St. for Burnett-Whyte.

Harrow. New wing, estimated to cost £22,955, to be added to Downer secondary grammar school.

Leicestershire. Modern school at Burbage estimated to cost £144,279.

London. Following projects have been included in L.C.C.'s 1954-55 school building programme: Tewkesbury estate area, Lewisham, £73,040; Sydenham Hill, £79,680; Charlton R.C., £142,800; Kingswood Drive, Camberwell, £582,400; Launcelot Rd., Lewisham, £462,000; Peckham House, Camberwell, £445,200; Norwood R.C., Lambeth, £142,800. Also, installation of electricity proposed in seven schools at present lit by gas. Estimated cost, £17,500.

Luton T.C. Tenders to be invited for erection of phase 1 of College of Further Education. Architects are Norman and Dawbarn, 5 Gower St., London W.1.

Manchester T.C. It is proposed to erect 32 houses at Woodhouse Park, Wythenshawe. Estimated cost, £46,529.

Margate T.C. Construction of 62 houses and 16 flats proposed on Park Lane site, and also 86 flats and 10 shops in Zion Place redevelopment area.

Middlesbrough T.C. Erection of 208 houses at Park End. Work to start in Feb. Borough Engineer.

Newark (Notts.). Approval given to erection of an instalment of secondary school at Southwell. Estimated cost, £92,390.

Newton Abbot R.D.C. Plans approved for 40 bungalows at Kingsteignton. Also, further houses to be built at Sharp's Crest.

Nottinghamshire. Expenditure of £712,133 has been approved on schools in 1953-54 programme. Largest are Bramcote Hills secondary technical school (£201,150), and Worksop Sparken House secondary technical school (£173,473).

Ormskirk U.D.C. Layout plans approved for about 190 houses on land in Wigan Rd.

Rothwell U.D.C. Erection of 40 flats on Wood Lane site. R. A. Easdale and Son, Architects' County Chambers, Bradley St.' Castleford.

Stockport T.C. Plans in hand for R.C. secondary school in Nangreave Rd. for Trustees of Diocese of Shrewsbury.

Stockton-on-Tees T.C. Tenders to be invited shortly for erection of 70 houses on Black Farm estate. Work to start in January.

Tenterden (Kent) R.D.C. Further 30 houses to be built at Woodchurch, 22 at High Halden and four each at Newenden and Rolvenden.

Tottenham B.C. Erection of 60 dwellings in phase 1 of Markfield estate. Borough Engineer, Town Hall, N.15.

Walsall T.C. Plans to proceed with provision of trolley vehicles up to cost of £150,000, and of electrical equipment up to cost of £181,000.

Warrington T.C. Construction of High School for Girls in Loushers Lane. Borough Surveyor, Town Hall.

Wednesbury T.C. Approval sought to plans for 78 houses at Mesty Croft, and 130 on Millfields estate.

Worcestershire. Erection of first part of College of Further Education at Stourbridge. Architect, F. Gibbard, 8 Percy St., London, W.1.

OVERSEAS

U.S.A. Miss Goldis of Walter Sporn Co., 7445 Exchange Ave., Chicago, 49, wants names of British manufacturers of electric travel irons.

TRADE NOTES

E.W.F. L. Jones (Burslem), Ltd., Fountain Place Bldgs., Liverpool Rd., Burslem, has ceased membership of the Electrical Wholesalers' Federation.

Thailand Imports. Among goods affected by further import restrictions just applied by Thailand, is electrical equipment, we understand.

Factory Acquisition. It is now reported that Johnson and Phillips Ltd. have purchased the New Cross factory of the Mazawatee Tea Co.

New Factory. British Timken, Ltd., are to build a new factory at Daventry, for the production of medium and very large tapered roller bearings. Initially, about 300 people will be employed there.

MEETINGS TO NOTE

THURSDAY, NOV. 26

I.E.S. (Nottingham).—Film evening.

INST. OF FUEL (Midland).—"Waste Heat Recovery for Steam Raising." C. Ungoed. James Watt Inst. Birmingham, 6 p.m.

TV SOCIETY.—"Converters for V.H.F. or U.H.F. TV." Cinematograph Exhibitors' Assoc., 164 Shaftesbury Ave., W.C.2, 7 p.m.

A.S.E.E. (Luton). — "Vocational Education in Relation to Supervising Electrical Engineer." W. H. Brooks. George Hotel, George St., 8 p.m.

FRIDAY, NOV. 27

INSTN. OF MECHANICAL ENGRS.—"Fuel Systems and Controls for Marine Gas Turbines." R. F. Darling. Also "Main Propulsion Gas Turbine Set for Oil Tanker 'Auris'." B. E. G. Forsling. Storey's Gate, S.W.1, 5.30 p.m.

I.E.E. (Tees-side).—Annual dinner at Zetland Hotel, Saltburn.

I.E.E. (N. Staffs).—"Technique and Development of Automatic Winding in Mine Shafts." B. L. Metcalf and G. Cuttle. Electricity Showrooms, Stoke, 7 p.m.

I.E.S. (Bath and Bristol).—"Lighting for Outdoor Sports." C. Holden. Elect. Board, Old Bridge St., Bath, 7 p.m.

I.E.S. (Cardiff).—Annual summer dance.

MANCHESTER ASSOC. OF ENGRS.—"Fluid Couplings and Application in Electric Motor and Diesel Engine Driven Equipment." E. C. Farrer. Engineers Club, Albert Sq., 6.45 p.m.

E.P.E.A. (S.E. Div.).—Annual dinner to Executive Council. Connaught Rooms, London, W.C.2, 5.30 p.m.

S. WALES INST. OF ENGRS.—Industrial film evening at the Institute, Park Place, Cardiff, 7 p.m.

SATURDAY, NOV. 28

I.E.E. (N. Lancs).—Dinner-dance at Cliffs Hotel, Blackpool, 6.30 p.m.

MONDAY, NOV. 30

I.E.E. (London Radio).—Section Soiree. Savoy Place, W.C.2, 6.30 p.m.

I.E.E. (S. Midland).—Faraday lecture on "Process Heating." O. W. Humphreys. Town Hall, Birmingham.

I.E.E. (Reading).—"Sound Recording." G. F. Dutton. George Hotel, 7.15 p.m.

INCORP. PLANT ENGRS. (West and East Yorks).—"Recent Applications of Electronics in Industry." R. H. Wheat. Leeds University, 7.30 p.m.

E.P.E.A. (London).—Discussion on "Transmission and Distribution Problems." F. J. Lane. Caxton Hall, Westminster, 7 p.m.

TUESDAY, DEC. 1

I.E.E. (London Measurements).—Discussion on "Influence of Legislation on Costs of Metering." S. Howarth. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Cambridge Radio).—"Electronics in Aircraft." Cavendish Laboratory, 8.15 p.m.

I.E.E. (N. Western).—"What is Philosophy?" Prof. Dorothy M. Emmet and Sir Samuel Hall. Ninth annual lecture with Manchester Univ. Engineers' Club, Albert Sq., Manchester, 7 p.m.

I.E.E. (S.E. Scotland).—"Special Effects for T.V. Studio Productions." A. M. Spooner and T. Worswick. Heriot-Watt College, Edinburgh, 7 p.m.

A.S.E.E. (S.E. London).—"Relays and Associated Equipment." Congregational Church Hall, Eltham, 8 p.m.

A.S.E.E. (W. London).—"Coloured Directional Light as Applied to the Stage." L. G. Applebee and P. Rose. Strand Electric Co., 29 King St., W.C.2, 7.30 p.m.

WEDNESDAY, DEC. 2

I.E.E. (London Radio).—"Telegraph Codes and Code Converters." T. Hayton, C. J. Hughes, and R. L. Saunders; also "Code Converters for Interconnection of Morse and Teleprinter Systems." B. O. Carter and L. K. Wheeler. Savoy Place, W.C.2, 5.30 p.m.

I.E.S. (Edinburgh).—"Dimming of Fluorescent Tubes and Stage Lighting." H. H. Ballin. Manor Club, 12 Rothsay Place, 7 p.m.

I.E.S. (Newcastle).—"Lighting for Enjoyment." T. O. Freeth. Roadway House, 8 Oxford St., 6.15 p.m.

I.E.S. (Swansea).—"Sports Lighting." Plaza Buildings, The Kingsway, 6.30 p.m.

I.E.E. (Teeside). — "Electrical Equipment of Blooming Mill." G. G. Nicholson. Cleveland Scientific and Tech. Inst., Middlesbrough, 6.30 p.m.

I.E.E. (S.W. Scotland).—"Special Effects for T.V. Studio Productions." A. M. Spooner and T. Worswick. 39 Elmbank Cres., Glasgow, 7 p.m.

I.E.E. (Rugby).—"Technique and Development of Automatic Winding in Mine Shafts." B. L. Metcalfe and G. Cuttle. College of Technology and Arts, 6.30 p.m.

I.E.E. (Southern).—"Design Features of Certain British Power Stations." S. D. Whetman and A. E. Powell. (Meeting with Instn. of Mechanical Engrs.) Municipal College, Portsmouth, 6.30 p.m.

WOMEN'S ENGINEERING SOC. (Manchester).—Members' evening at International Club.

A.S.E.E. (N. London).—"Water Heaters." Queens Head, 677 Green Lanes, Harringay, N.4, 7.45 p.m.

THURSDAY, DEC. 3

I.E.E. (London). — "Technical Arrangements for Sound and T.V. Broadcasts of Coronation." W. S. Procter, M. J. L. Pulling and F. Williams. Savoy Place, W.C.2, 5.30 p.m.

I.E.S. (Glasgow).—"Application of Dimming Fluorescent Tubes." H. H. Ballin. 39 Elmbank Cres., 6.30 p.m.

I.E.S. (Glos. and Cheltenham).—"Interior Decoration and its Influence on Lighting." A. G. Ellis. G.E.C., 2 St. Aldate St., Gloucester, 6.30 p.m.

I.E.S. (Nottingham). — "Some Problems in Railway Lighting." E. Morgan. Elect. Board, Smithy Row, 6 p.m.

BRIT. INSTN. OF RADIO ENGRS. (Scottish).—"B.B.C. Television O.B. Unit." 39 Elmbank Cres., Glasgow, 7 p.m.

BRIT. INSTN. OF RADIO ENGRS. (N. Western).—"Monitoring of High Speed Waveforms using a Sampling Technique." J. G. MacQueen. Coll. of Technology, Manchester, 7 p.m.

I.E.E. (E. Midland).—Faraday lecture on "Process Heating." O. W. Humphreys. De Montfort Hall, Leicester, 7.15 p.m.

I.E.E. (N. Midland).—"275 kV Developments on British Grid System." D. P. Sayers, J. S. Forrest, F. J. Lane. Elect. Offices, Ferensway, Hull, 7.15 p.m.

INST. OF FUEL (N. Western).—"Modern Approach to Smoke Abatement." A. Marsh. Liverpool Engrng. Soc., 9 The Temple, Dale St., 7 p.m.

A.S.E.E. (S. London).—"Electrical Motor Application." A. N. D. Kerr. Cafe Royal, Croydon, 8 p.m.

EXHIBITION DIARY

Fuel Efficiency.—Being held in Manchester until Nov. 28.

Building.—Open at Olympia, London, until Dec. 2.

TRADE MARKS

Suncimo. 719,655. Class 7. Electric motors. F. C. August Ltd., 27 Broughton Rd., Thornton Heath.

Sylvan. 712,022. Class 7. Portable drilling machines, etc. F. W. Kubach, 12 Sylvan Rd., S.E.19.

Tempomat. 718,875. Class 9. Welding apparatus, etc. Philips Electrical Ltd., Century House, Shaftesbury Ave., W.C.2.

Unibord. 720,278, Class 9. Motor control and regulating apparatus. Brookhirst Switchgear Ltd., Northgate Works, Newry Park, Chester.

Volex. 710,945. Class 11. Electrical apparatus and installations for lighting, steam generating, cooking, etc. Volex Electrical Products, Ltd., 37 Brown Street, Manchester 2.

Uniolamp. 707,152. Class 11. Lamps and fluorescent tubes. Union Lamp and Lighting Co., Ltd., 121 Victoria St., S.W.1.

Vibravox. 718,994. Class 9. Electronic apparatus, etc. Jennings Musical Instruments Ltd., 119 Dartford Rd., Dartford, Kent.

Woodpecker. 721,309. Class 9. Machinery operation control apparatus. F. Shaw and Co., Ltd., Corbett St., Ashton New Road, Manchester 11.

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PUMPLESS – AIR COOLED – UP TO ANY CAPACITY

Simple and reliable, robust, compact; backed by nearly 50 years' experience, Hewittic Rectifiers have proved to be the ideal converting plant for all forms of D.C. load — traction, electro-chemical, light and power, industrial, battery charging, cinema arcs, etc. Send for further details.

OVER 1¼ MILLION KW. IN WORLD WIDE SERVICE

The illustration shows Hewittic Rectifiers in traction service in Canada (British Columbia Electric Co.). Each bank has a capacity of 1,500 kW. with high overload rating for heavy traction service. The total capacity of Hewittic Rectifiers on this system is approximately 30,000 kW.

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
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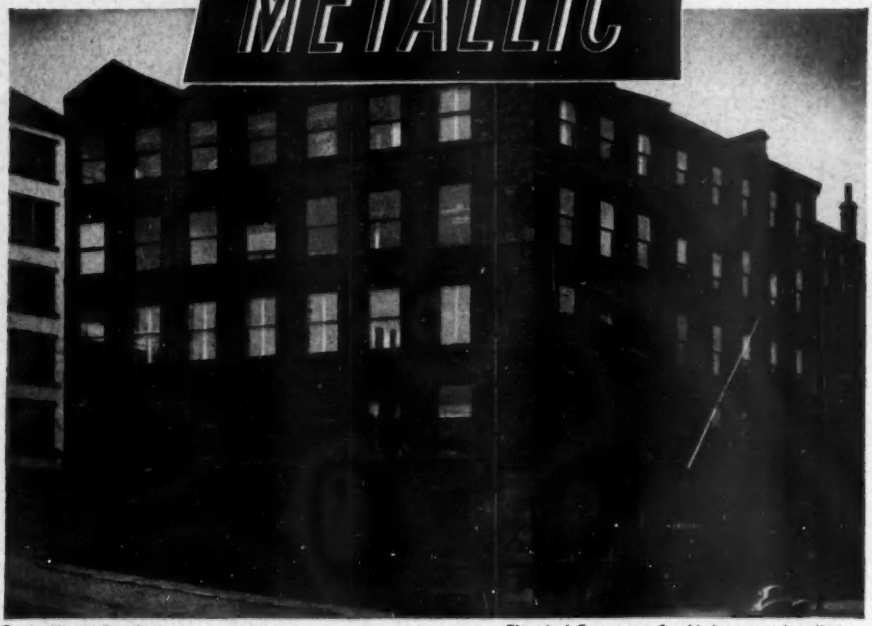

Oswin House, Bradford.
Photo by courtesy of Stroud Riley & Co., Ltd.

Electrical Contractors for this important installation:
A. R. Farrar & Co. Ltd.

A TI COMPANY

It may be a school, it may be a factory—a power station or a housing estate, but more often than not the electrical specification will be—METALLIC.

This Yorkshire building is no exception, being fitted throughout with METALLIC conduit and fittings—unequalled for quality and consistent accuracy.

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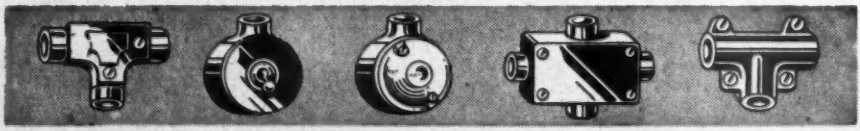

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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

COUNTY BOROUGH OF SWANSEA

WEST CROSS HOUSING ESTATE
129 TRADITIONAL HOUSES
TENDERS FOR ELECTRICAL INSTALLATIONS

ELECTRICAL ENGINEERS wishing to tender for the electrical installation for 129 Traditional Houses at West Cross Estate are invited to submit applications to the Borough Architect, The Guildhall, Swansea, on or before December 7, 1953.

Plans, specifications and conditions of contract will be forwarded on application and deposit of two pounds, provided applicant gives satisfactory evidence of having previously carried out work of a similar character.

The deposit will be refunded after delivery of a bona fide tender (not subsequently withdrawn) and the return of all documents. The lowest or any other tender will not necessarily be accepted.

T. B. BOWEN,
Town Clerk.

The Guildhall,
Swansea.
November 12, 1953. (F 644)

CITY OF NORWICH

ILLUMINATION OF PEDESTRIAN CROSSING BEACONS
CONTRACT FOR THE SUPPLY OF EQUIPMENT

TENDERS are invited for the supply of equipment consisting of flasher unit, strap-on type box and perspex globes, together with ancillary equipment, for 18 pedestrian crossings within the City of Norwich.

Form of Tender, Specification and Bill of Quantities may be obtained from the City Engineer, City Hall, Norwich, upon deposit of £1 1s., payable to the Norwich Corporation, which will be refunded upon receipt of a bona fide tender.

Tenders endorsed "Flashing Beacons" must be delivered to the office of the undersigned not later than 12 noon on Wednesday, December 16, 1953.

H. C. ROWLEY, M.I.C.E.,
City Engineer.

City Hall,
Norwich. (F 694)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 92/53.

APPLICATIONS invited for superannuable N.J.B. appointments of ENGINEERING DRAUGHTSMEN, Generation (Construction) Department, Divisional Headquarters. Salary "D" 6, £433 to £567 p.a.

Knowledge of mechanical and/or electrical installations and plant layout. H.N.C. or equivalent desirable.

Application forms obtained from Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Road, Gabalfa, Cardiff, should be returned by December 7, 1953.

November 16, 1953. (F 687)

UGANDA ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments on the permanent staff:

(1) ELECTRICAL FITTER with experience in the installation and maintenance of outdoor and indoor substations and associated H.V. switchgear, transformers and other equipment. Experience with voltages up to 132 kV would be an advantage.

(2) ELECTRICIAN with experience in the maintenance and repair of domestic electric apparatus and appliances including refrigerators.

Salary of each post within scale rising from £783 p.a. to £1,053 p.a. (including cost of living allowance of 35%), the point of entry being determined according to age and experience.

Uganda has a pleasant and healthy climate, while taxation and cost of living are not high.

Free partly furnished accommodation is provided. Free medical and dental treatment. Three-year contract in the first instance with free passages to and from Uganda up to a maximum of three adult fares. Vacation leave on full pay.

Application forms and further information may be obtained from the Board's London Office at 27 Regent Street, London, S.W.1. Applications to reach London office by December 8, 1953.

C. R. WESTLAKE,
Chairman.

P.O. Box 559,
Kampala. (F 696)

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

APPLICATIONS are invited for the appointment of POWER STATION SUPERINTENDENT of Keadby Power Station, Nr. Scunthorpe. The station will have an ultimate capacity of 360 MW.

Present Salary £1,335-£1,269 per annum. Class "H," Grade 1 National Joint Board Agreement.

Applicants should have had wide experience in the operation and maintenance of large modern power station plant and have held a position of responsibility involving the control of technical and administrative staff.

Preference will be given to engineers who are corporate members of the Institution of Electrical Engineers and/or the Institution of Mechanical Engineers or who hold the necessary qualifications for membership.

Housing estate is adjacent to the Power Station and in certain circumstances a house could be made available.

Applications on Forms A.E.6/ACT obtainable from Divisional Secretary (Establishments), British Electricity House, St. Mary's Road, Leeds 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(F 724)

NORTH WESTERN GAS BOARD

North Cheshire Group

GROUP ELECTRICAL SUPERINTENDENT

APPLICATIONS are invited for the above pensionable appointment at a salary within Grade A.P.T. 10 (£665 to £765 per annum).

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers, or have passed Section A and B or be exempt therefrom.

Applicants should have experience in the operation and maintenance of 1,500-kW alternators, 6·6-kV, 3·3-kV and 440-V distribution systems, electric motors and starters up to 500 h.p. at 3·3 kV, and the organisation of routine electrical maintenance.

Detailed applications, giving the names of two referees, should reach the General Manager, North Western Gas Board (North Cheshire Group), Great Portwood Street, Stockport, within 14 days. (F 686)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division.

CIVIL ENGINEERING DRAUGHTSMEN
Construction Department. Vacancy No. 22/53.

Candidates should have experience in design and detail of reinforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction drainage, and sanitation schemes, associated with office and administrative buildings.

The salary will be in accordance with Grade 5 (£567 to £671 per annum) or Grade 6 (£433 to £567 per annum) of Schedule "D" of the National Joint Board Agreement.

ENGINEERING DRAUGHTSMEN (MECHANICAL)
Construction Department. Vacancy No. 44/53.

Senior Draughtsmen are required in the Mechanical Section of the Construction Department at North Wilford Power Station. Candidates should have experience in one or more of the following:—

1. Design and layout of power station equipment, including turbo-alternators, boiler plant, coal and ash plant, and general station auxiliaries.
2. H.p. and l.p. steam and feed pipework. Condensing plant and feed heating systems.
3. Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salary and conditions of service will be in accordance with the National Joint Board Agreement Grade 5 (£567 to £671 per annum) and Grade 6 (£433 to £567 per annum) of Schedule "D" according to experience.

ENGINEERING DRAUGHTSMEN (ELECTRICAL)
Construction Department. Vacancy No. 61/53.

Candidates should have experience in the preparation of layouts and diagrams for the installation of e.h.t. and l.t. switchgear, transformers, e.h.t. and l.t. cables. Knowledge of protective gear systems would be an advantage.

The salary will be in accordance with Grade 5 (£567 to £671 per annum) or Grade 6 (£433 to £567 per annum) of Schedule "D" of the National Joint Board Agreement.

GENERAL ASSISTANT ENGINEER
Technical Department, Div. H.Q. and also in the Nottingnam Regional Office. Vacancy No. 132/53.

The minimum technical qualification is Higher National Certificate but a degree in electrical engineering is preferred for the Divisional Headquarters vacancy.

Applicants must have experience of the operation and maintenance of switchgear and protective gear.

The salary will be in accordance with Schedule "C", Class "AX/DX," Grade 8 (£501 to £694 per annum) of the National Joint Board Agreement.

The closing date for this appointment will be December 3, 1953.

GENERAL ASSISTANT ENGINEER
Transmission (Construction) Department, Div. H.Q.
Vacancy No. 136/53.

Candidates should have had a good general education and practical experience in the design, manufacture, testing, installation and commissioning of all types of switchgear up to and including 132 kV as used in grid substations. Transformer experience an advantage. Duties will be principally the supervision of contractors engaged on the installation and modification of equipment at substation sites throughout the Division and also carrying out acceptance tests.

Salary and conditions of service will be in accordance with Class "AX/DX," Grade 8, Schedule "C" of the N.J.B. Agreement (£501 to £694 per annum).

The closing date for this appointment will be December 10, 1953.

SENIOR ASSISTANT TO THE EDUCATION AND TRAINING OFFICER
Div. H.Q. Vacancy No. 124/53.

In the first instance the duties will be concerned with the "Training Within Industry" scheme and the individual appointed will be required to attend a short course organised by the Ministry of Labour and National Service and subsequently to conduct groups and organise appropriate follow-up, maintenance of records, etc.

Candidates should have a good background education.

The salary will be within Grade 5 (£640 to £700 per annum) of the National Joint Council Agreement.

The closing date for this appointment will be December 10, 1953.

The above positions will be pensionable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the undersigned by the dates stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.
(F 717)

SOUTH EASTERN ELECTRICITY BOARD

SENIOR DEMONSTRATOR (FEMALE)
Worthing District

SALARY £460 by £20 to £520 p.a. under N.J.C. Agreement, Grade 2. Superannuable. Applicants will be required to supervise demonstrators, organise and conduct demonstrations and public lectures, and to advise consumers on the use of all domestic apparatus. Candidates must possess a recognised diploma or certificate in domestic science and the E.A.W. certificate.

Applications, stating age, education, qualifications and experience, giving names of two referees must reach M. J. Mortimer, M.I.E.E., Worthing Manager, SEEBoard, 56 Chapel Road, Worthing, Sussex by December 7, 1953.

CARTOGRAPHIC DRAUGHTSMAN (MALE)
West Kent District

Salary, £160 at age 16 to £375 at age 26, rising subject to satisfactory service to £450 per annum, plus London Weighting. Superannuable. Applicants should have a sound general education and experience of general drawing office routine.

Applications, on forms obtainable from P. S. Watson, M.I.E.E., West Kent District Manager, SEEBoard, 270 High Street, Orpington, Kent, giving two referees, to be returned by December 7, 1953.

DISTRICT COMMERCIAL ENGINEER
Sevenoaks District

Salary £803 to £834 per annum under N.J.B., Class "E," Grade 4. Superannuable. Applicants must be experienced in the organisation and control of a commercial department and conversant with tariffs, sales and all aspects of service to domestic and industrial consumers, including a thorough knowledge of domestic appliances. A good knowledge of rural electrification, negotiations for extension of mains and experience in the application of electricity to farms and in the organisation and control of an extensive contracting and sales section with a present turnover of £60,000 per annum is also required.

Applications, giving the names of two referees, must reach H. F. Gill, District Manager, SEEBoard, Electric House, Oxted, by December 7, 1953.

A. L. BURNELL,
Secretary.
(F 716)

ELECTRICITY SUPPLY BOARD

VACANCY: TELECOMMUNICATIONS SECTION

THE ELECTRICITY SUPPLY BOARD has a vacancy in its Head Office, Dublin. The position (pensionable) is associated with the carrier telephone and telemetering equipment of its high tension system.

Applicants should have a University degree in electrical engineering or be Corporate Members of the I.E.E., and should also have a sound knowledge and experience of carrier equipment, automatic exchanges, cable laying and testing.

Consideration may be given to applicants who have qualified for graduateship of the I.E.E. and possess the final certificate in telecommunications engineering of the City and Guilds of London Institute and who have, in addition, extensive experience of the type indicated above.

The commencing salary will have regard to qualifications and experience, and, in the case of a fully qualified candidate, will be at an appropriate point in a salary scale at present £540 per annum to £980 per annum.

Applications, giving date of birth and full details of technical training, qualifications and experience, should be addressed to the Personnel Officer, 27 Lower Fitzwilliam Street, Dublin, and should reach him not later than December 5, 1953.

PATRICK J. DEMPSEY,
Secretary.
November, 1953. (F 669)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following posts in the Generation (Construction) Department at Divisional Headquarters:

THIRD ASSISTANT ENGINEERS

Salary, Class "AX/DX," Grade 3, 4 or 5, £681-£1,066 per annum (including London Weighting), depending on qualifications and experience.

Applicants should possess the Higher National Certificate or its equivalent and have had previous experience (a) in the design and installation of mechanical plant for Generating Stations, and/or a knowledge of boiler and turbine design; or (b) previous experience in the preparation of schemes for switchgear, electrical auxiliaries, main and secondary cable installations and other equipment associated with modern generating stations. A knowledge of motor control equipment and of sequence interlocking systems would be an advantage.

Applications, stating age, qualifications and experience, should be sent to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than December 12, 1953.

W. N. C. CLINCH,
Controller.
(F 714)

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area

Castleford District

GENERAL ASSISTANT DISTRICT ENGINEER

APPLICANTS must have had a sound practical training with experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the district and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers or who hold equivalent qualifications.

Salary: N.J.B., Class "E," Grade 11, £524 to £540 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Road, Wakefield, not later than December 10, 1953.

No. 7 (Grimsby) Sub-Area

ASSISTANT (ESTABLISHMENTS)

Applicants should have a sound knowledge of the agreements of the negotiating bodies and the maintenance of records and preparation of reports relating to personnel. Some experience of superannuation schemes, welfare work and a knowledge of the procedure in connection with local advisory, staff and works committees, and education and training schemes, will be an advantage.

Salary: N.J.C., Grade 2, £460 to £520 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than December 10, 1953.

CHARGEHAND OVERHEAD LINESMAN

Applications are invited for the above position in the Grimsby District.

N.J.I.C. (Supply) conditions, the present rate being 3s. 8d. per hour for a 44-hour, five-day week.

Applications, giving full particulars, should be sent to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than December 10, 1953. (F 700)

CITY OF SALISBURY

Southern Rhodesia

VACANCY FOR TECHNICAL ASSISTANT GRADE 2

APPLICATIONS are invited for the post of Technical Assistant, Grade 2, on the salary scale £900 x £50 to £1,150, in the Test Section of the Electricity Department.

Candidates should have a thorough knowledge of, and be able to carry out tests on all types of protection on H.T. and L.T. switchgear on site and in the Test Room. They should have had experience on General Test Room work and on instruments and relays. Preference will be given to candidates with a sound technical training and who have technical qualifications.

The appointment will be subject to Council's Service and Leave Regulations, which will be made available at the offices of the undersigned. The salary payable will commence at the minimum of the above scale, and rise by annual increments to the maximum; no cost of living or other allowances are payable.

The successful candidate must be able to comply with the requirements of the Southern Rhodesia Immigration Authorities, and will be required to submit a satisfactory medical certificate of fitness.

Applicants are requested to submit full particulars of their qualifications, training and experience, giving details of positions held, marital state, age, place of birth and nationality. Copies of not more than three recent testimonials may be included.

Canvassing, directly or indirectly, will be a disqualification.

Applications, suitably endorsed on the cover, must reach the offices of the undersigned on or before Saturday, December 19, 1953. Airmail paper should be used.

DAVIS & SOPER LTD.,
Agents to the City Council of Salisbury.

52 and 54 St. Mary Axe,
London, E.C.3.
November 20, 1953 (F 697)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

DEMONSTRATOR for Berwick District, N.J.C., Grade 1. Applicants must have some experience and should preferably hold a Domestic Science Certificate.

Applications, stating age, education, qualifications and experience, should be sent to the Manager, South East Scotland Electricity Board, Southern Sub-Area, High Street, Galashiels, by December 4, 1953. (F 701)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions:

THIRD ASSISTANT ENGINEER (STEAM)
S/13.467

Generation (Operation) Department, Divisional Headquarters, Portsmouth

Applicants should possess a thorough knowledge of thermodynamics and be experienced in the determination of efficiency and losses occurring in large turbines and condensing plant. A sound knowledge of boiler testing is also required and applicants should be well acquainted with all instruments employed in this work. Plant operating experience will be an advantage. Preference will be given to those possessing qualifications admitting to corporate membership of a senior professional institution.

Salary: N.J.B., "AX/CX 5," £649-£835.

GENERAL ASSISTANT ENGINEER
S/13.468

Non-destructive Testing Section, Generation (Operation) Department

Applicants must have a knowledge of electronics and measurement techniques, and should preferably possess experience of electricity generating stations and have practical mechanical ability. Preference will be given to those possessing qualifications leading to corporate membership of an appropriate professional institution.

Salary: N.J.B., "AX/CX," Grade 8, £501-£675.

THIRD ASSISTANT ENGINEER (CIVIL) and GENERAL ASSISTANT ENGINEER (CIVIL)
S/13.469

Generation (Construction) Department
Divisional Headquarters, Portsmouth

Applicants must have had a sound technical training and experience in heavy civil engineering work, preferably in the construction of large power stations or in one or more of the following:

(a) Piled and reinforced concrete foundations;
(b) Wharves and jetties, or tunnelling;
(c) Large steel frame buildings.

Candidates for the post of Third Assistant should be corporate members of an appropriate engineering institution or have technical qualifications and experience admitting to corporate membership. Those applying for the post of General Assistant should possess qualifications leading to corporate membership as above.

Salary: Third Assistant, N.J.B., "AX/CX.5", £649-£835.
General Assistant, N.J.B., "AX/CX.8", £501-£675.

GENERAL ASSISTANT ENGINEER
S/13.471

Technical Department, Divisional Headquarters, Portsmouth

Applicants should have had suitable experience of technical work in relation to either protective gear, system development or special investigations into technical problems.

Preference will be given to those who possess either qualifications and experience admitting to corporate membership of a recognised professional institution, or who are studying for the examinations of such an institution.

Salary: N.J.B., "AX/CX," Grade 8, £501-£675.

Special application forms, obtainable from P. D. A. Oliver, Divisional Secretary, 111 High Street, Portsmouth, must be returned by Wednesday, December 9, 1953. (F 725)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT COMMERCIAL OFFICER required in the St. Helens District of the Board's No. 2 Sub-Area. Salary £791-£818 per annum (N.J.B., Class "F," Grade 5). Applicants should have had considerable experience on the commercial side of the Electricity Supply Industry, including the supervision of contracting work. Membership of the Institution of Electrical Engineers, or a similar qualification desirable.

The appointment is superannuable and subject to medical examination.

Standard application forms obtainable from the Manager, No. 2 Sub-Area, Electricity House, Sandiway, Nr. Northwich. Closing date, December 8, 1953. (F 711)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

SHIFT CHARGE ENGINEER is required at Walsall Generating Station. N.J.B. service conditions, superannuable appointment, salary within Schedule "A," Grade G.7, commencing at £729 per annum.

A sound technical training and practical experience in the operation and maintenance of boilers, turbines and e.h.t. switchgear are required. Suitable technical qualifications an advantage.

Apply on Forms AE.6, quoting Vacancy No. 554 MD to the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, by December 12, 1953. (F 715)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable post. Salary, including London allowance, and conditions of service in accordance with N.J.B. Agreement, Schedule "A." Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

ASSISTANT SHIFT CHARGE ENGINEER
Bankside Generating Station

Sound engineering and technical training with practical experience in operation of power station plant essential. Salary: Class "H," Grade 9, £714 p.a. Applicants for previous vacancy need not re-apply.

THIRD ASSISTANT ENGINEER
Transmission Department, Divisional Headquarters

Experience required in laying, jointing and testing of underground cable up to 132 kV and also have experience in the design and manufacture of cables and cable systems. Salary, Schedule C, Class "AX," Grade 5, within range £681 9s. to £829 10s. p.a., rising to ultimate maximum of £927 3s.

Application may be made on form obtainable from Divisional Secretary, B.E.A., London Division, Generation House, Great Portland Street, W.1, and be received within 14 days of this advertisement. (F 702)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

Edinburgh Sub-Area

JUNIOR ENGINEERS

APPLICATIONS are invited from men who have had an engineering training and desire to make their career in the electricity supply industry. The commencing salary under the National Joint Board Agreement will be Grade H.17, £402 to Grade H.14, £516 per annum, according to experience and qualifications. These posts offer further excellent training and experience and provide scope for advancement.

The positions are superannuable and subject to a satisfactory medical examination.

Applications in writing stating age, education, qualifications, training and present position should be sent within 14 days, to G. T. Allcock, Sub-Area Manager, Dewar Place, Edinburgh 3. (F 688)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

LITTLEBROOK POWER STATION (480 MW).—ENGINEERING DRAUGHTSMAN. Applicants should have had experience of power station building and plant design and construction. Preference will be given to those with mechanical experience and who have been educated to H.N.C. standard. Schedule D, Grade 6, £433 to £567 per annum plus London allowance. N.J.B. conditions of service and salary.

Applications, giving details of present position, education, experience, etc. should be received by the Station Superintendent, Littlebrook Power Station, nr. Dartford, Kent, not later than December 7, 1953. (F 695)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

JUNIOR COMMERCIAL ASSISTANT (Technical) required in the Runcorn District of the Board's No. 2 Sub-Area. Salary: £451/£466 per annum (N.J.B., Class "F," Grade 14).

Duties include estimating for contracting work, advising consumers on matters relating to electricity supply and utilisation of electrical equipment. Applicants should be in possession of an O.N.C. in electrical engineering.

The appointment is superannuable and subject to medical examination.

Standard application forms obtainable from the Manager, No. 2 Sub-Area, Electricity House, Sandiway, near Northwich, Cheshire. Closing date, December 7, 1953. (F 698)

BRITISH ELECTRICITY AUTHORITY

REQUIRED, a SECOND ASSISTANT ENGINEER in the Utilisation Research Section at Headquarters, London.

Candidates should be electrical engineers, preferably with a University Degree or equivalent qualification, and with experience of the engineering and commercial sides of the Supply Industry. Duties will be to assist in researches in the field of electricity supply and utilisation with particular reference to the load characteristics of, and the economics of supplying, the various classes of consumers and loads.

Salary N.J.B., Grade 3, £940-£1,200 p.a. inclusive.

Applications stating age, qualifications, experience, present position and salary to D. Moffat, Director of Establishments, British Electricity Authority, Winsley Street, London, W.1, by December 12, 1953. Quote reference AE431. (F 726)

EASTERN ELECTRICITY BOARD

Norfolk Sub-Area

SENIOR SALES REPRESENTATIVE
Great Yarmouth/Lowestoft District. Lowestoft Branch.

CANDIDATES must be of good address and have a sound practical training with experience in electrical installation work for domestic, commercial and industrial premises. A knowledge of installation department procedure and ability to prepare estimates is essential. Candidates should also have a definite aptitude for selling, and possession of the E.D.A. Salesmanship Diploma would be an advantage.

The salary will be in accordance with Grade 2 (£460 by £20 to £520) of the National Joint Council Salary Agreement and future salaries and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a Superannuation Scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Manager, Gt. Yarmouth/Lowestoft District, Eastern Electricity Board, Regent Road, Great Yarmouth, Norfolk, within 14 days of the appearance of this advertisement. (F 712)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 264/53. MAINTENANCE ENGINEER (Mechanical). Carlisle Generating Station. Salary £738 to £771 ("P" 6).

Vacancy No. 265/53. OPERATION ENGINEER. Carlisle Generating Station. Salary £738 to £771 ("P" 6).

Vacancy No. 266/53 SHIFT CHARGE ENGINEERS. Whitehaven Generating Station. Salary £493 to £537 ("A" 7).

Vacancy No. 262/53. DRAUGHTSMEN (Mechanical) and DRAUGHTSMEN (Electrical). Generation Construction Drawing Office, Agecroft, near Manchester. Applicants should have had experience of (a) the layout of generating stations, or general mechanical engineering or (b) cable layout and electrical diagrams. Salary, depending on qualifications and experience, in range £433 to £567 or £567 to £671 (Schedule "D" 6 or 5).

Applications to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before December 5. Quote vacancy number. (F 684)

CENTRAL ELECTRICITY BOARD FEDERATION OF MALAYA

A NUMBER of ELECTRICAL ENGINEERING POSTS (various categories) are vacant in the above Board. Salaries, etc., between £1,197 and £2,730 according to experience and dependants. Option of appointment (a) on agreement for three years with prospect of permanency or (b) on contract for three years with gratuity of £200 to £280 a year. Option to terminate appointment at end of first year in both cases if desired. Free passages. Liberal leave on full salary. Candidates, preferably Grads. or Corp. Members of I.E.E. or I.M.E. must have sound training and appropriate experience. It will be possible to preserve superannuation rights in certain cases.

Write to the Crown Agents, 4 Millbank, London S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/28770/EE. (F 685)

SOUTHERN ELECTRICITY BOARD

ARCHITECTURAL DRAUGHTSMAN

NO. 1 (SOUTHALL) Sub-Area, Waterloo Road, Uxbridge. Salary N.J.B., Schedule "D," Grade 6 (£458-£595 7s. per annum inclusive of London allowance). N.J.B. conditions of service.

Applicants should be neat draughtsmen and preferably have had considerable experience in an architect's office.

The successful candidate will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 2/6 Windmill Lane, Southall, Middlesex, and returned to him not later than December 7, 1953. (F 713)

APPLICATIONS are invited for the posts of OVERHEAD LINESMEN to be located in the Staythorpe and Drakelow areas. Experience of 132 kV steel tower lines essential. Conditions and wages in accordance with N.J.I.C. Schedule.—Applications, stating age, experience, etc., should be submitted through Ministry of Labour to Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham. Please quote vacancy No. 118/53. (F 718)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

ASSISTANT MECHANICAL MAINTENANCE ENGINEER required for organisation in East London district, operating large electrical station. Applicants should have wide and up-to-date experience in the maintenance of modern generating station power plant and be capable of supervising turbine and boiler overhauls. Technical qualifications should be sound. Age not less than 32 or over 45. Commencing salary approximately £950 per annum with non-contributory pension. Position has excellent prospects.—Reply to Box No. 3061, Electrical Times, quoting Ref. TME/7. (F 636)

BRITISH ELECTRICITY AUTHORITY, Merseyside and North Wales Division require STATION SHIFT CONTROL ENGINEER at the Percival Lane Power Station, Runcorn. Salary £600 to £630 per annum. Class "G," Grade 10, N.J.B. Superannuable and subject to medical examination. Applicants must have had experience in the control room of a modern power station. Qualifications entitling the applicant to Graduate or Student Membership of an appropriate Institution will be an advantage.—Forms of application from the Divisional Secretary, Beaconsfield Road, Woolton, Liverpool. Closing date December 8, 1953. (F 719)

BRITISH ELECTRICITY AUTHORITY, Merseyside and North Wales Division, require a STATION SHIFT CONTROL ENGINEER at the Lister Drive Power Station, Liverpool. Salary £577-£598 per annum. N.J.B., Class "F," Grade 10. Superannuable and subject to medical examination.

Applicants must have had experience in the control room of a modern power station and should possess a Higher National Certificate in Electrical Engineering or equivalent qualification.

Forms of application from the Divisional Secretary, Beaconsfield Road, Woolton, Liverpool. Closing date: December 8, 1953. (F 720)

BRITISH LUMA require FOREMAN for Filament Winding Department, now being extended.—Apply, stating age, experience, marital status, and salary required to Manager, Hardgate Road, Glasgow, S.W.1. (F 689)

BRUCE PEEBLES AND CO., LTD., Engineers, Edinburgh, 5, require an ASSISTANT INSULATION ENGINEER for all types of rotating machines up to 11 kV.—Applications, stating age, qualifications, experience and salary required, should be submitted to Mr. V. P. Mackay, Manager, Rotating Plant Department, at the above address. (F 622)

BRUCE PEEBLES & CO., LTD., have vacancy in the Transformer Design Department for SENIOR ENGINEER with experience of large high voltage transformers. Good technical qualifications essential, experience in transformer design advantageous but not absolutely necessary. Salary commensurate with qualifications.—Applications stating salary desired to the Manager, Transformer Department, Bruce Peebles and Co., Ltd., East Pilton, Edinburgh 5. (F 720)

DRAUGHTSMAN (ELECTRICAL) required for integrated iron and steel works. Previous experience in the iron and steel industry not essential, but candidates must have had experience in designing, estimating and preparing specifications for factory electrical installations. Applicants should be under 30 years of age and possess at least a National Certificate in electrical engineering.

Applications, giving age and details of qualifications and experience, and stating the salary required, should be submitted to the Chief Engineer, Workington Iron and Steel Co., Moss Bay, Workington, Cumberland. (F 614)

DRAUGHTSMAN required for a senior position in South Wales Office. Applicants should be experienced in layout of heavy electrical plant and services. Mechanical engineering draughtsmen with some electrical experience would be considered. Good facilities, including a canteen, are available. The person appointed will work directly with responsible engineers and will have ample opportunities of following the work on site from initial stages to final commissioning.—Please write stating age, married/single, education, experience and present salary to Box No. 3089, Electrical Times. (F 690)

ELECTRIC MOTORS. There are opportunities with an established Manufacturing Company for inside SALES ENGINEERS to handle inquiries and orders for industrial motors. Vacancies in London, Birmingham and Cardiff. Generous salary offered with participation in non-contributory Pension Scheme.—Box No. 3053, Electrical Times. (F 623)

ELECTRICAL CONTRACTOR (London) has vacancy for ESTIMATOR used to large contracts, capable of handling them from inquiry to completion. Exceptional opportunity for experienced man able to accept responsibility. Applications will be treated confidentially. State age, salary, with concise particulars of experience.—Box No. 3063, Electrical Times. (F 637)

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

ELECTRICAL CONTRACTOR, requires ESTIMATOR and SUPERVISOR for small contracts London area. Write, stating age, experience and salary required.—Box No. 3035, Electrical Times. (F 572)

ELECTRICAL DRAUGHTSMAN required by Glasgow firm of engineers for new development project. Five-day week, canteen and superannuation scheme in operation. Written applications desired in the first instance outlining technical education (which should be to at least O.N.C. standard), previous drawing office experience and salary required.—Write 21N6, Wm. Porteous and Co., Glasgow. (F 730)

ELECTRICAL DRAUGHTSMEN required for power distribution layouts and lighting installation for industrial plants. London Office. Five-day week, pension scheme.—Write age, qualifications, experience and salary required to Foster Wheeler Limited, 3 Ixworth Place, S.W.3, or telephone KEN 6363. (F 727)

ELECTRICAL ENGINEER required for service in the Middle East. Qualifications to A.M.I.E.E. desirable, possession of Higher National Certificate essential. Applicants should have had wide experience in the construction of e.h.v. and l.t. overhead and underground networks, sub-station construction and distribution. Experience in the erection and testing of power stations, switchgear and generators an advantage. Age 35-40 years. —Application to Box No. 3101, Electrical Times. (F 731)

ELECTRICAL ENGINEER, young, with experience in offices of consulting engineers, electrical manufacturers or electrical contractors, required by large firm of electrical contractors opening new offices in London. Good business connections in London an advantage. Excellent prospects of rapid promotion for applicant with technical qualifications and able to handle staff and clients.—Apply, in writing, stating age, experience and qualifications to Box No. 3091, Electrical Times. (F 691)

ELECTRICAL SALES ENGINEER with direct selling ability, for Yorkshire. Car owner, interest in Earthing an advantage. Splendid opportunity for the right man. 28-40 yrs.—Box No. 3103, Electrical Times. (F 732)

ELECTRICIAN for large British Engineering firm in the Sudan. Good practical experience, capable initially of supervising unskilled native labour in the field in erection of cables, overhead transmission lines, internal house wiring, etc., and of developing into full Electrical Engineer; excellent prospects for keen, progressive man. Age 24/28, must be unmarried and physically fit. Commencing salary equivalent to around £705 dependent age, experience, with annual £48 increments plus simply furnished quarters. Plus provident scheme, good leave with free passages. There is no income tax. Good references essential.—Apply with copy references and full particulars to Box No. 3099, Electrical Times. (F 726)

EXPERIENCED DRAUGHTSMAN for air brake switchgear development. Five-day week. Pension scheme. Salary will be commensurate with experience and ability.—Apply in writing giving details to Personnel Manager, Revo Electric Co., Ltd., Tipton, Staffs. (F 692)

FERRANTI LTD. wish to make new appointments in their Power Transformer Design Office and invite applications from suitable candidates for positions as DESIGN ENGINEERS. A University degree is desirable but other alternative qualifications will be considered. Previous design experience in power engineering (not necessarily on transformers) would be an advantage. Applications are also invited from young graduates or holders of the Higher National Certificate with an interest and preferably some experience in design of transformers or other electrical plant.

The appointments are to the permanent staff of an expanding design group and carry attractive salaries with excellent prospects of advancement. The positions are covered by the firm's Staff Pension Scheme.

Forms of application from Mr. R. J. Hebbert, Staff Manager., Ferranti Ltd., Hollinwood, Lancs. Please quote reference WLE. (F 548)

HANDLEY PAGE (READING), LTD., The Aerodrome, Woodley, Reading, have a vacancy in their Design Office for a SENIOR AIRCRAFT ELECTRICAL DRAUGHTSMAN. They have an interesting project on hand, the post is progressive and offers good scope for advancement to the right man.—Please send full particulars to the Personnel Office. (F 640)

MARRYAT AND SCOTT, LTD., of Wellington Works, Hounslow, Middlesex, require LIFT DRAUGHTSMEN for layout work and design. Bonus and superannuation.—Apply in writing with full details of past experience. (F 588)

METER MANUFACTURERS, N.W. LONDON, require SENIOR AND JUNIOR TEST ENGINEERS for progressive posts in their Test Depts. State education, technical training, experience, salary required.—Box No. 3071, Electrical Times. (F 661)

PERMANENT positions with excellent opportunities will be offered to applicants suitably qualified for the following:

(a) DESIGNERS experienced in electronic control gear. Good electrical and mechanical design and layout ability essential.
(b) SENIOR DRAUGHTSMEN with electrical/mechanical experience required for motor control gear, knowledge of electronics advantageous. Thorough shop training and extensive drawing office experience essential.
(c) DRAUGHTSMEN required for mechanical and electrical work on industrial electronic equipment. Experience on this type of product whilst an advantage is not essential and men with good electrical or mechanical drawing office experience will be considered.

Vacancies exist in a new factory in the Stoke-on-Trent area. Replies giving full details of training experience, also age and salary required, and quoting Ref. AGI to be sent to Box No. 3075, Electrical Times. (F 663)

REPRESENTATIVE REQUIRED for Birmingham and Midland Counties by old-established firm manufacturing Electrical Heating and Catering equipment. Own car essential. Write, giving particulars of age, experience, etc.—Box No. 3059, Electrical Times. (F 627)

SALES DEPARTMENT MANAGER, Cable Works in London Area, to supervise preparation of deliveries to customers (home and overseas), advices, dispatch, invoicing, export procedure and technicalities, etc. Required to attend to all customers' inquiries and queries, must be tactful, able to control mixed staff, and to co-operate willingly and effectively with the other departments. Only those with good knowledge and experience on selling side of cable industry will be considered.—Full particulars, experience, salary required, to Box No. 3079, Electrical Times. (F 665)

SENIOR SALES ENGINEER, with specialised knowledge of industrial motors and control gear, to be responsible for small group of Sales Engineers. Appointment based on London. Generous salary and expenses. Non-contributory pension scheme.—Box No. 3055. Electrical Times. (F 624)

TECHNICAL ASSISTANT required for drafting of Electrical Regulations, Codes of Practice, etc. Graduate I.E.E. or corresponding qualification necessary, also experience in committee work and drafting of reports. Commencing salary, £550 to £650, depending upon age and qualifications. Progressive post. Pension scheme.—Box No. 3095, Electrical Times. (F 704)

THE RESEARCH LABORATORIES OF BROOKHIRST SWITCHGEAR, Chester, and IGRANIC ELECTRIC, Bedford, invite applications from GRADUATES with an honours degree in electrical engineering interested in work involving the more fundamental investigations into motor control problems. Previous works training and laboratory experience desirable, but not necessarily in this field. The appointments are permanent, pensionable and there are excellent prospects for advancement. Good starting salary according to experience.—Apply in first instance to Group Personnel Officer, Metal Industries, Ltd., Victoria Station House, 191 Victoria Street, London, S.W.1. (F 722)

THERE ARE VACANCIES in the Rand Undertaking Power Stations of the Electricity Supply Commission in the Union of South Africa for:—

CONTROL ENGINEERS
SECTIONAL ENGINEERS
ASSISTANT RESIDENT ENGINEERS
SHIFT ENGINEERS
JUNIOR SHIFT ENGINEERS
DISTRICT ASSISTANTS
SWITCHBOARD ATTENDANTS

Generous salaries and service conditions are offered and all positions offer good prospects of advancement to men of ability, energy and initiative.
Rail and sea passages will be provided for selected applicants, their wives and minor children, subject to agreement to serve the Commission for at least two years.
For full particulars apply to:—
(Rand Undertaking Vacancies)
The London Representative,
Electricity Supply Commission,
535-546 The Adelphi,
John Adam Street,
London W.C.2. (F 721)

TECHNICAL ASSISTANT. A vacancy occurs for a graduated Electrical/Mechanical Engineer, to undertake interesting development work in a progressive company, with a large programme of expansion and long-term development. The post offers considerable scope covering several branches of interesting technology, and for the gaining of a wide industrial experience. Apprenticeship and design or development experience would be advantageous, and salary will be paid according to merit. —Apply, Box No. 3093, Electrical Times. (F 703)

APPOINTMENTS WANTED

ELECTRICIAN, armature winder wishes employment overseas, age 24, single.—Box No. 3043, Electrical Times. (F 595)

ELECTRICIAN, sound training contracting and maintenance, desires further overseas employment. At present on leave from Far East. Plenty of initiative; can take charge. Good references as to character and ability, age 29, single; available immediately.—Box No. 3105, Electrical Times. (F 733)

WORK WANTED

A.C. and d.c. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (F 13)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95 Park Lane, Leeds 1. (F 22)

FISHER FOUNDRIES, LTD., Greet, Birmingham, have immediate capacity for machine moulded PRECISION CASTINGS in gunmetal and grey iron, ¼ to 30 lb. All castings shot blasted.—Telephone: Birmingham, Victoria 0197. (F 16)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (F 17)

WANTED

A.C.-D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd. 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (F 8)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London, N.1. (F 4)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady Street, Bethnal Green, E.1. (F 1)

WANTED. Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock water-tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox water-tube boilers for dismantling. —Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath, Staffs. (F 2)

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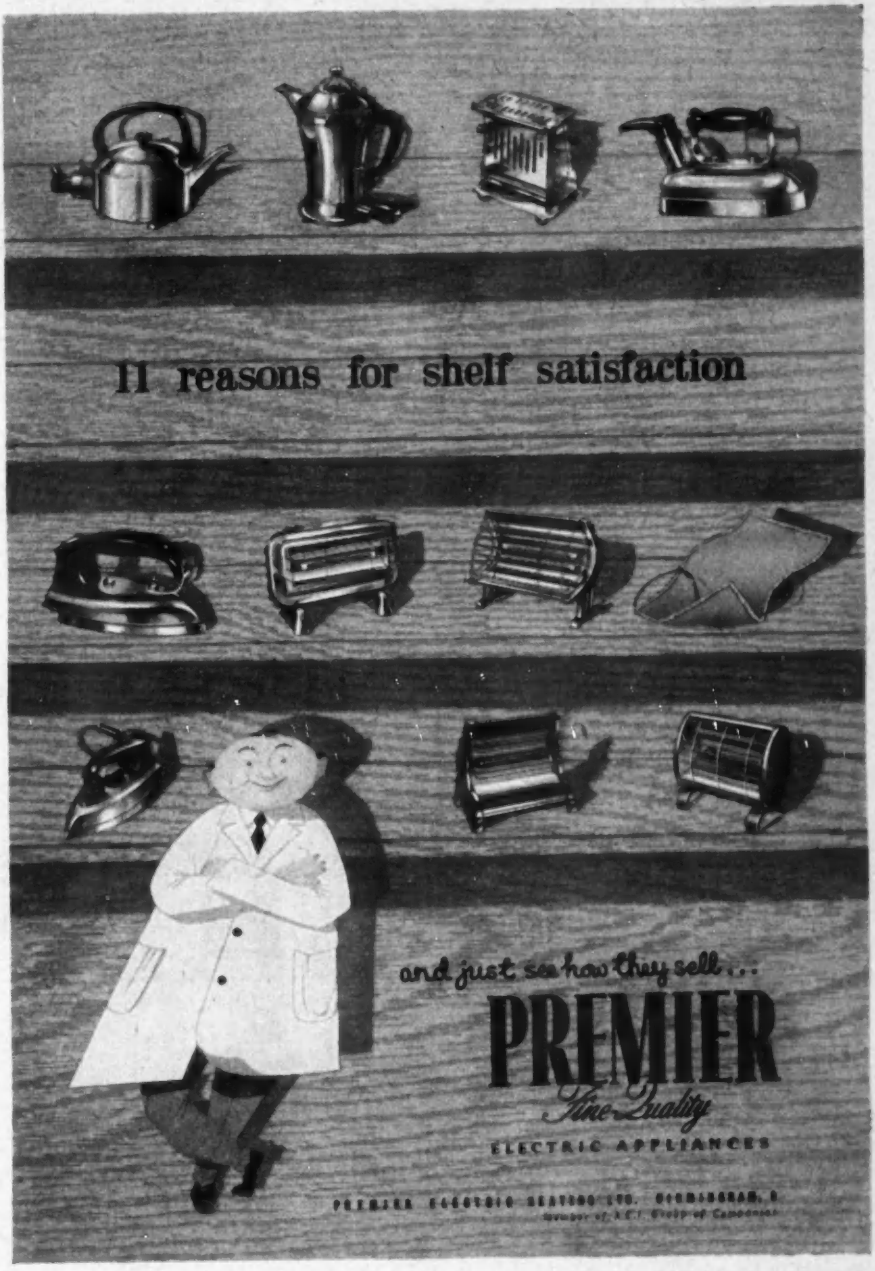
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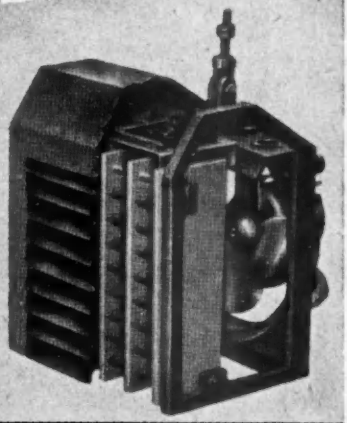

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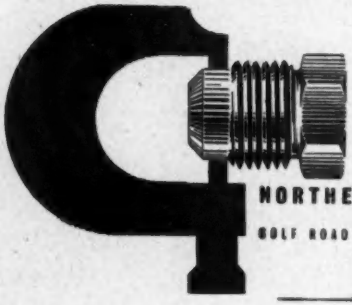

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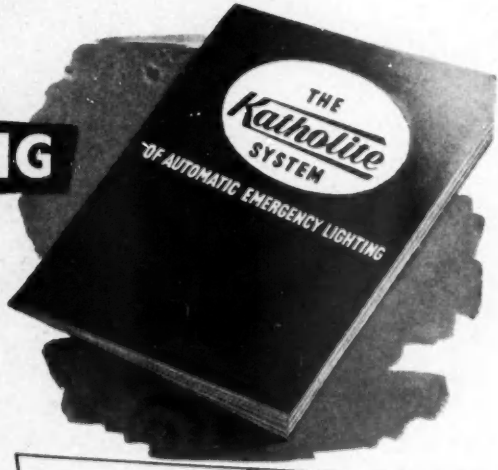

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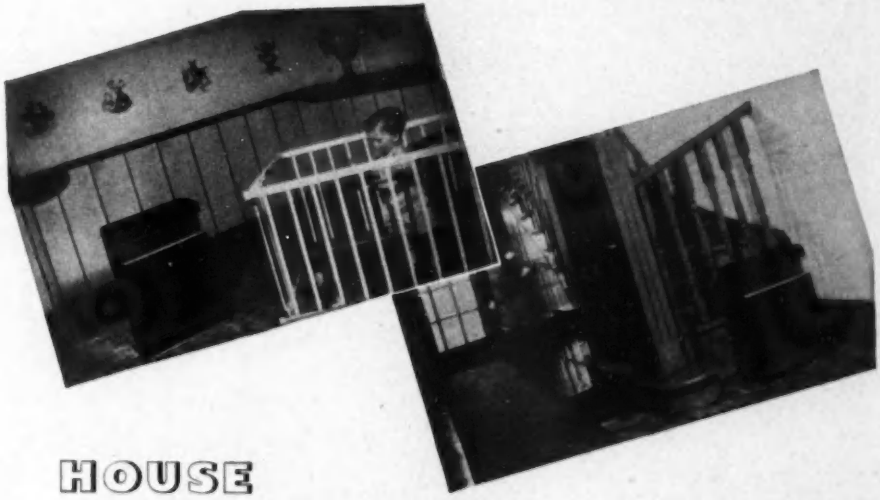

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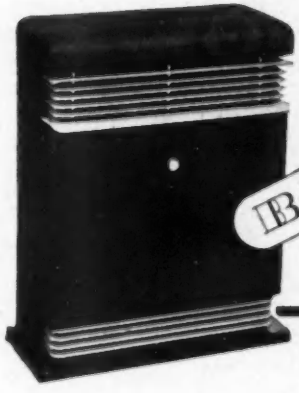

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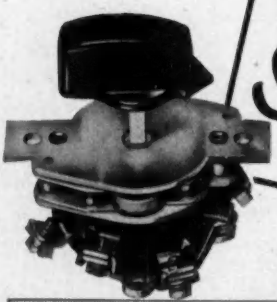

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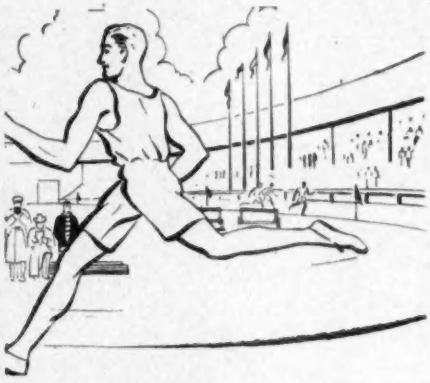

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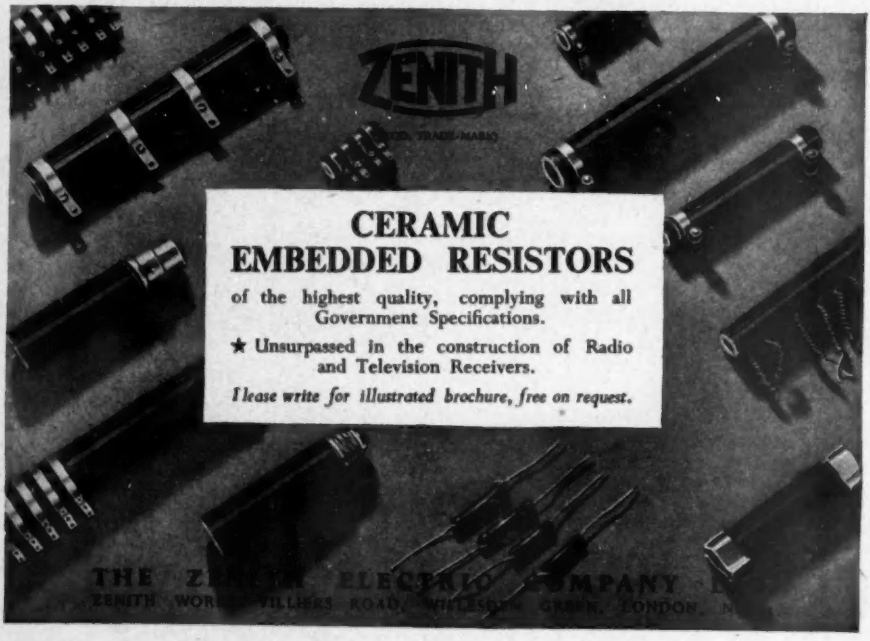
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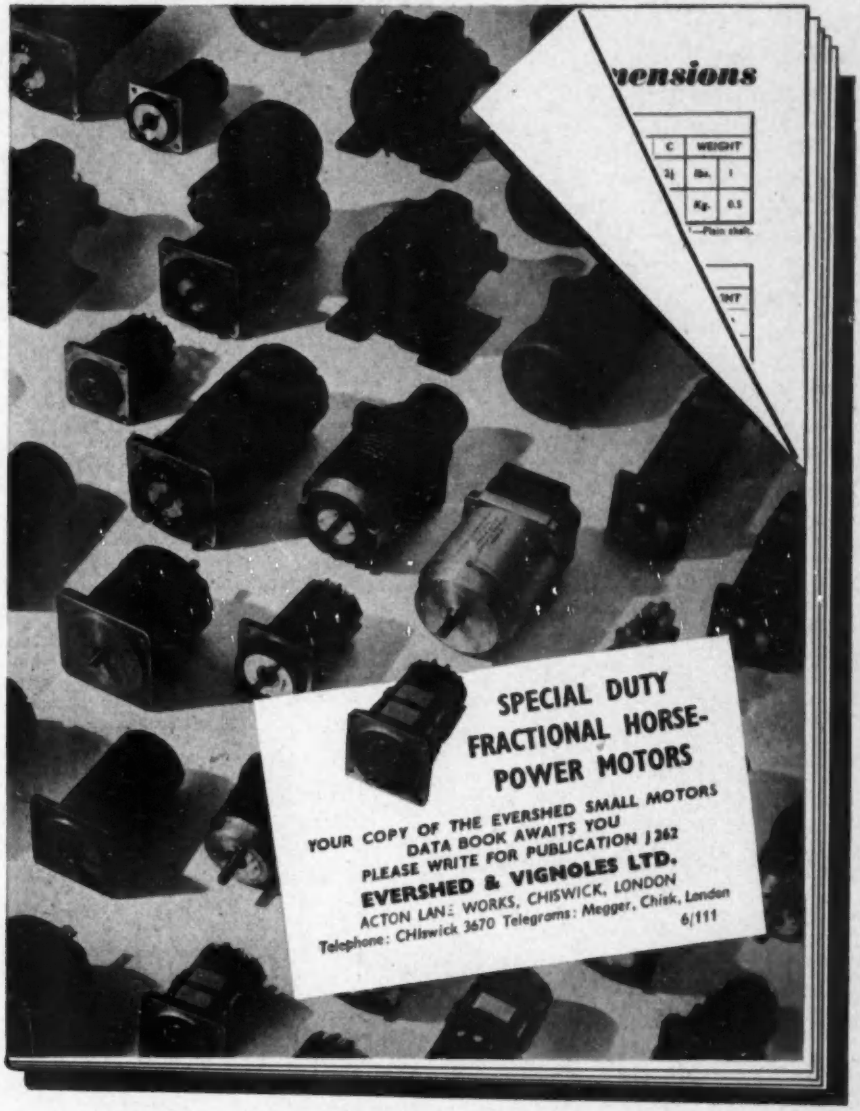
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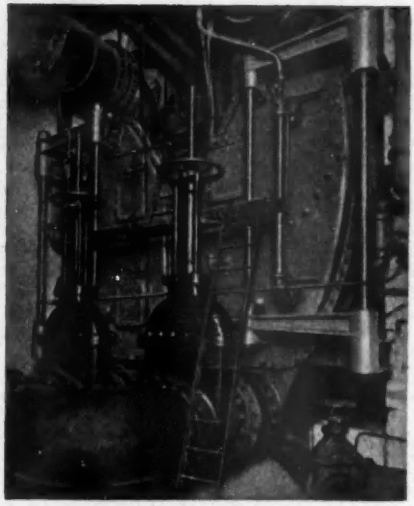

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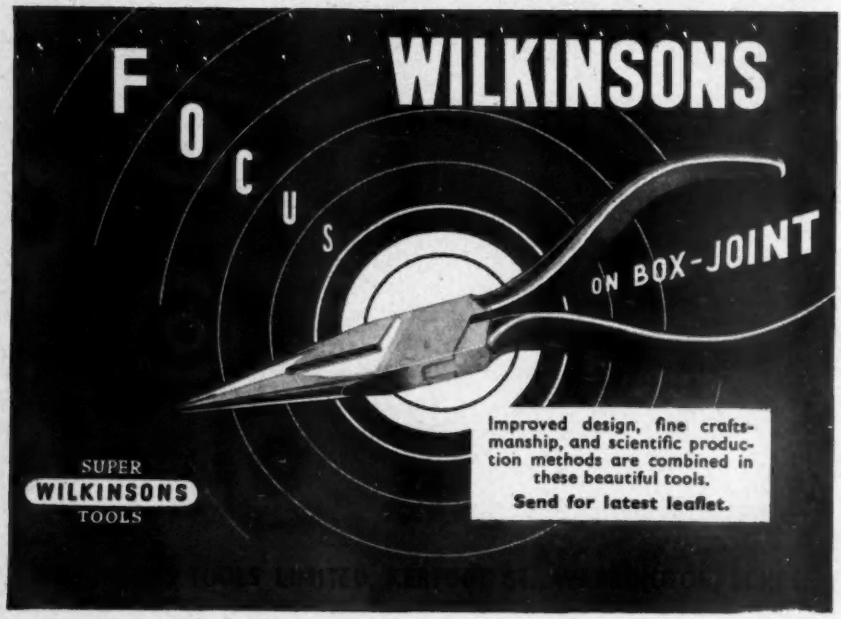

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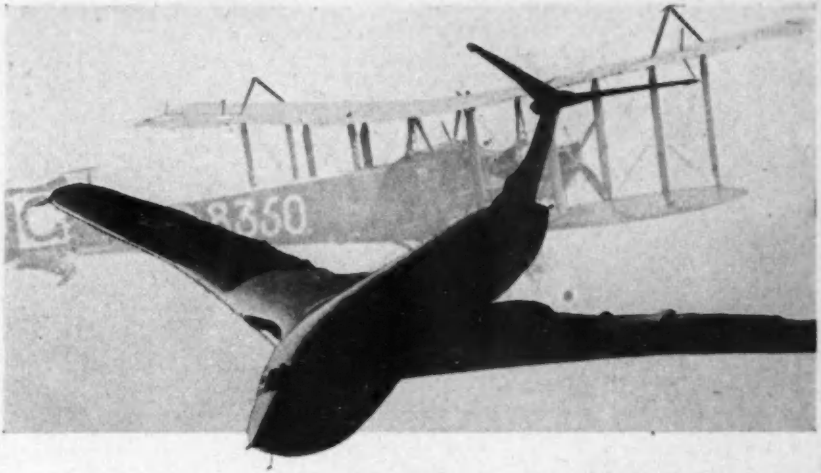

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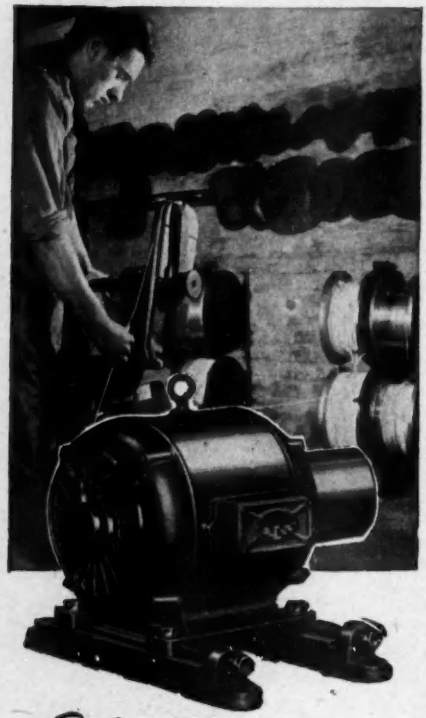

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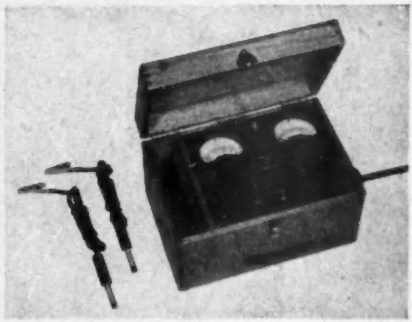

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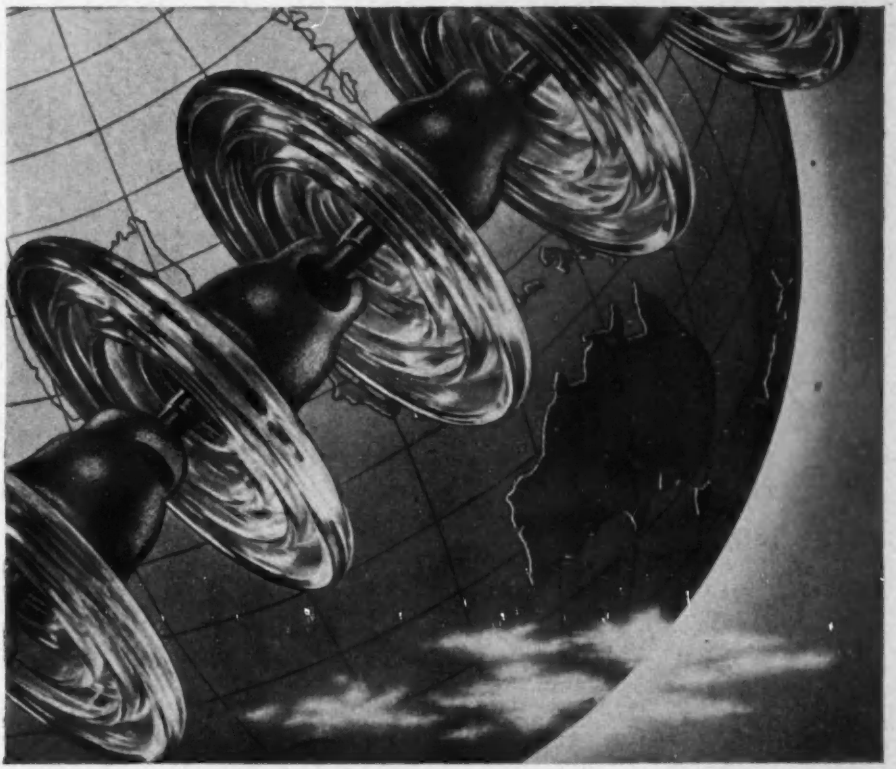

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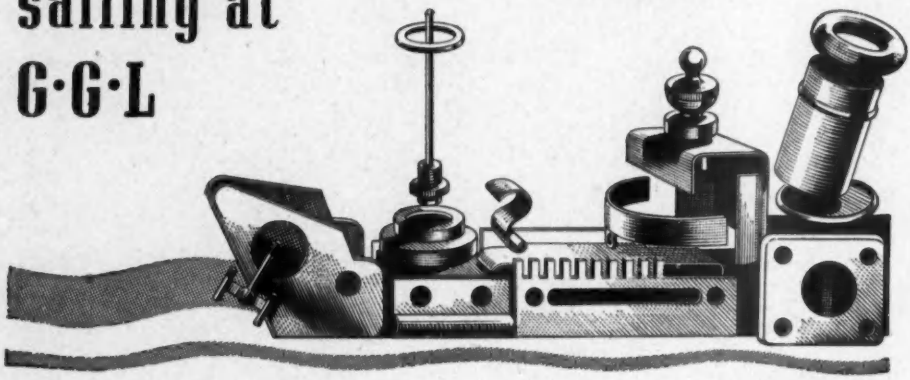

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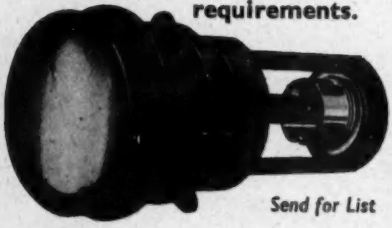

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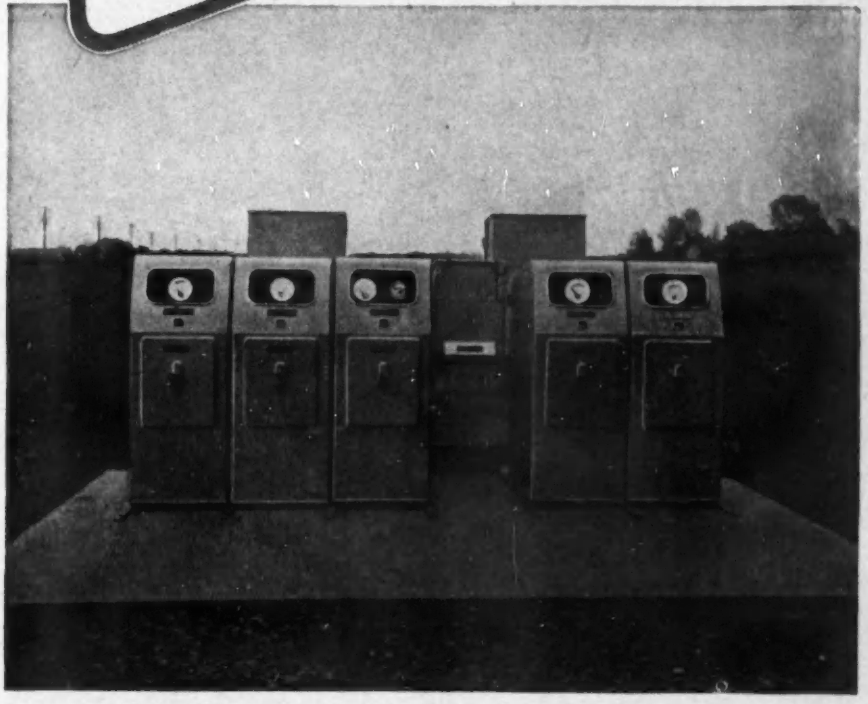

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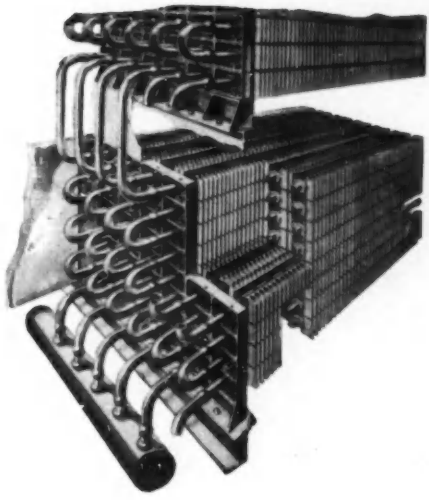

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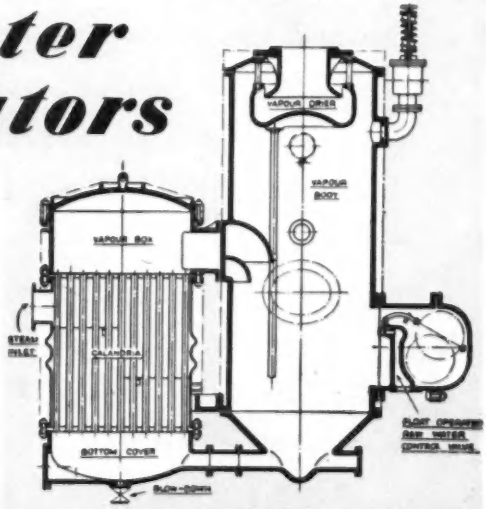

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